PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-098721

(43)Date of publication of application : 14.04.1998

(51)Int.Cl. H04N 7/24
H03M 7/46
H04N 1/41
H04N 5/92
H04N 9/804
H04N 9/808
H04N 11/04

(21)Application number : 09-209336

(22)Date of filing : 04.08.1997

(71)Applicant : TOSHIBA CORP
TOSHIBA AVE CORP

(72)Inventor : KIKUCHI SHINICHI
MIMURA HIDENORI
TAIRA KAZUHIKO
KITAMURA TETSUYA

(30)Priority

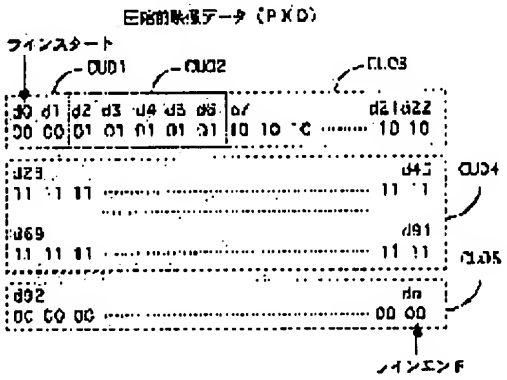
Priority number : 06327460 Priority date : 28.12.1994 Priority country : JP

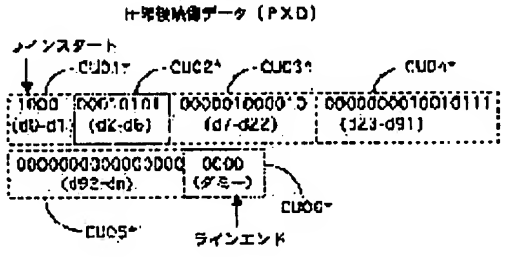
(54) ENCODING AND DECODING SYSTEM FOR IMAGE INFORMATION

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain the encoding method which compresses and encodes image data on an animation, etc., by providing a compressed data generation step, a step for modifying the bit constitution of an encoded header according to data length on the number of successive identical pixel data in a data block as one compression unit, etc.

SOLUTION: This method has a compressed data specifying step for specifying data blocks of one compression unit (CU01 to CU04) in a collection of information, a compressed data generation step for generating an encoded header corresponding to the number (e.g. 1 to 255) of successive identical pixel data in the data blocks of the one compression unit, data (e.g. 2 to 8 bits) on the number of successive pixels showing the identical pixel data succession





number (1 to 255), and compressed unit data blocks CU01* to CU04*, and a step for modifying the bit constitution of the encoded data according to the data length on the identical pixel data succession number of the data blocks of the one compression unit.

LEGAL STATUS

[Date of request for examination]	04.08.1997
[Date of sending the examiner's decision of rejection]	06.07.1999
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

JAPANESE [JP,10-098721,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the following.
[0002] (1) For example, the encoding approach which compresses and encodes image data, such as a caption by which digital storage was carried out, or simple animation.
[0003] (2) The decoding approach which decodes the data by which compression coding was carried out [above-mentioned].
[0004] (3) Compression / elongation system by which the above-mentioned encoding/decoding approach was put together.
[0005] (4) The program which makes a microcomputer etc. perform the above-mentioned encoding approach and/or the decoding approach.
[0006] (5) The devices which perform signal processing based on the above-mentioned encoding approach (integrated circuit etc.).
[0007] (6) The devices which perform signal processing based on the above-mentioned decoding approach (integrated circuit etc.).
[0008] (7) The recording device which records various information on a record medium based on the above-mentioned encoding approach.
[0009] (8) The regenerative apparatus which reproduces the information recorded on the above-mentioned record medium based on the above-mentioned decoding approach.
[0010] (9) Broadcast/distribution system which does broadcast/distribution of various information compressed and encoded based on the above-mentioned encoding approach through wireless or a cable.
[0011] (10) The electronic mail system or telecommunications system which exchanges various information compressed and encoded based on the above-mentioned encoding approach through the network circuits (Internet etc.) using wireless or a cable.
[0012]
[Description of the Prior Art] For example, as an approach of compressing image data, such as a caption, and recording or communicating, the following approaches are learned from the former.
[0013] The 1st approach divides text data every other character, and is data logging or a character code transformation method which carries out data communication about the character code corresponding to the alphabetic character. As current and a character code, the 2-byte code used for Japanese etc. and the single byte code used for English etc. are used abundantly. As a Japanese code, JIS code, a shifted JIS code, etc. are used, and the ASCII code etc. is used as an English code.
[0014] However, it is necessary to prepare character-font ROM corresponding to each character code in a picture reproducer side, and the character code to which that character-font ROM is not equivalent has inconvenient [of being unreproducible] by this 1st approach. For this reason, in order to make picture reproducer correspond to two or more language, character-font ROM is needed for every language.
[0015] The 2nd approach is the approach of compressing the whole amount of data by reading text data as image data (image data), and encoding it. As an example of representation of this coding approach, there is the run length compression approach (run-length compression method).
[0016] When the same data are continuing in the pixel data (pixel data) which scanned and obtained text data for every line, this run length compression approach changes the die length of that continuation

pixel into a run length sign, and records or transmits what carried out code translation.
[0017] For example, the case where a pixel data line like "aaaabbbbbbbccccccdd" is obtained is considered. By the run length compressing method, this is changed into the data (run length compression sign) which consist of pixel information (a, b, c, d) and the number of continuation pixels (4, 7, 5, 2) which shows the number of these pixel information, as shown in "a4, b7, c5, d2."
[0018] As an approach of changing this run length compression sign into a binary-ized sign (binary code) further, the modified Huffman code-ized approach (Modified Huffman Codings) and the algebraic-sign-ized approach (Arithmetic Codings) are learned.
[0019]
[Problem(s) to be Solved by the Invention] First, "the modified Huffman code (it is written as MH sign below)" standardly adopted by facsimile is explained briefly. However, the color of the contents (i.e., the pixel itself) of image information of MH sign being applied is the case of two colors of white and black.
[0020] The algorithm designed so that the amount of data might become small by the whole data file is used for MH sign by seeing statistically, assigning a binary bit code with little (it being easy) number of bits to data with the high frequency of occurrence (data often used), and assigning a binary bit code with much (it being complicated) number of bits to data with the low frequency of occurrence (data rarely used).
[0021] By this MH coding approach, if there are many classes of data which it is going to encode, the code table itself will become large. Moreover, the complicated code table of the number corresponding to the number of data which it is going to encode is needed on the both sides of an encoder and a decoder.
[0022] For this reason, MH coding in the multilingual system handling various language is accompanied by big cost rise on the both sides of an encoder and a decoder.
[0023] Next, an approximate account is performed about the algebraic-sign-ized approach.
[0024] In algebraic-sign-izing, first, data are read and the frequency of occurrence of each data is investigated. Next, a code table is created by assigning a code with little number of bits to order with the high frequency of occurrence. In this way, the created code table is recorded as data (or transmission). Then, coding of data is performed based on this code table.
[0025] By the algebraic-sign-ized method, although a code table must be recorded or transmitted, there is an advantage which can create data in the optimal code table for the contents of the file which is going to record or transmit. Moreover, it is not necessary to have a complicated code table in the both sides of an encoder and a decoder like the MH encoding method by the algebraic-sign-ized method.
[0026] However, by the algebraic-sign-ized method, in case data are encoded, in order to create a code table, 2 times reading of data must be performed and decoding is also complicated.
[0027] Moreover, there is an approach indicated by the United States patent (USP) No. 4,811,113 official report as the image coding approaches other than the two above-mentioned example. By this approach, the flag bit which shows the number of bits of code data length was prepared before the run length sign, and it is encoded and decoded, having used as code data length the value which carried out the integral multiple of that flag bit.
[0028] Although a large-scale code table is not needed like the MH encoding method since a data length is drawn from a flag bit in the case of this approach, it is easy to complicate the circuitry inside a decoder by the hardware for drawing code data length.
[0029] Moreover, although this approach can perform encoding/decoding of two colors (white and black) like the MH encoding method, if it remains as it is, it cannot respond to compression of the multi-colored picture image beyond it.
[0030] The 1st purpose of this invention is offering the encoding approach of the image information which can cancel the weak spot (a large-scale code table's is the need) of the MH encoding method, the weak spot (2 times reading of data is the need) of an algebraic-sign-ized method, and the weak spot (it is un-corresponding to compression of a multi-colored picture image) of a run-length-coding method with a flag bit (USP4,811,113 reference) on practical use level.
[0031] The 2nd purpose of this invention is offering the decoding approach which decodes the data encoded along with the 1st purpose.
[0032] The 3rd purpose of this invention is offering compression / elongation system by which the

encoding (compression) approach and the decoding (elongation) approach in alignment with the 1st and 2nd purposes were put together.
[0033] The 4th purpose of this invention is offering the program which makes a microcomputer etc. perform the decoding approach in alignment with the encoding approach or the 2nd purpose in alignment with the 1st purpose.
[0034] The 5th purpose of this invention is offering the devices (integrated circuit etc.) which perform signal processing based on the encoding approach in alignment with the 1st purpose.
[0035] The 6th purpose of this invention is offering the devices (integrated circuit etc.) which perform signal processing based on the decoding approach in alignment with the 2nd purpose.
[0036] The 7th purpose of this invention is offering the recording device which records various information on record media (two-sheet lamination form high density optical disk etc.) based on the encoding approach in alignment with the 1st purpose.
[0037] The 8th purpose of this invention is offering the regenerative apparatus which reproduces the information recorded on the above-mentioned record medium based on the decoding approach in alignment with the 2nd purpose.
[0038] The 9th purpose of this invention is offering broadcast / broadcast/distribution system to distribute for various information compressed and encoded based on the encoding approach in alignment with the 1st purpose through wireless or a cable.
[0039] The 10th purpose of this invention is offering the electronic mail system or telecommunications system which exchanges various information compressed and encoded based on the encoding approach in alignment with the 1st purpose through the network circuits (Internet etc.) using wireless or a cable.
[0040]
[Means for Solving the Problem] In order to attain the 1st purpose of the above, the encoding approach of this invention The inside of the information aggregate (drawing 9 PXD; drawing 10 SPD) which two or more pixel data defined by the predetermined number of bits (for example, 2 bits) gather, and is formed, In what compresses the data block which the same pixel data follow as 1 compression unit (for example, CU01-CU04 of drawing 9) The inside of said information aggregate (PXD/SPD), The data block of said 1 compression unit (CU01-CU04) The compressed data specification step to specify (ST801 of drawing 13); The coding header corresponding to the number of the same pixel data continuation in the data block of said 1 compression unit (for example, 1-255) (for example, 0-6 bits in the regulations 1-4 of drawing 5), With the number data of continuation pixels (for example, 2-8 bits) in which this number of the same pixel data continuation (1-255) is shown, and the data (2 bits) in which the same pixel data in the data block of said 1 compression unit itself are shown The compressed data generation step which generates the compressed unit data block (CU01*-CU04* of drawing 9) (ST806 of drawing 13 ; ST908-ST914 of drawing 14); It responds to the data length of the number of the same pixel data continuation in the data block of said 1 compression unit. It has the step (ST908-ST911 of drawing 14) which changes the bit pattern of said coding header.
[0041] In order to attain the 2nd purpose of the above, the decoding approach of this invention The inside of the information aggregate (drawing 9 PXD; drawing 10 SPD) which two or more pixel data defined by the predetermined number of bits (for example, 2 bits) gather, and is formed, It is what elongates the bit string compressed considering the data block which the same pixel data follow as one unit (ST1005 of drawing 15). [when said data block contains the coding header which points out the number data of continuation pixels corresponding to the number of continuation of said same pixel data or said same pixel data, and its number data of continuation pixels] Among said information aggregates (PXD/SPD) from the data block of said 1 compression unit (for example, either of CU01* - CU04*) The coding header fetch step which takes out said coding header by 2 bitwises (ST1101-ST1107 of drawing 16); In said coding header fetch step (ST1101-ST1109) It is based on the contents (for example, the data length of 0-6 bits in the regulations 1-4 of drawing 5 ; in the case of data length zero, a total result is not influenced like the regulation 1 of drawing 5) of the taken-out coding header. From the data block of said 1 compression unit (either of CU01* - CU04*) Said number data of continuation pixels (for example, 2-8 bits; like the regulation 5 of drawing 5) the case of; zero which the case of data length zero may also have -- a total result -- not influencing -- the number fetch step of continuation pixels (ST1110-ST1113 of drawing 16) to take out, and; -- from the data block of said 1 compression unit (either of CU01* - CU04*) The coding header taken out in said coding header fetch step (ST1101-

ST1109) (for example, 0-6 bits), It is based on remaining (for example, 2 bits of the pixel data in the regulations 1-4 of drawing 5). the number data of continuation pixels (2-8 bits) taken out in said number fetch step of continuation pixels (ST1110-ST1113) were deducted -- The pixel data decision step which determines the contents (00, 01, 10, 11) of the pixel data before the compression which constituted the data block of said 1 compression unit (either of CU01* - CU04*) (ST1114 of drawing 16); by said pixel data decision step (ST1114) It arranges by the bit length the number data of continuation pixels (2-8 bits) taken out in said number fetch step of continuation pixels (ST1110-ST1113) indicate the bit data of the determined contents to be. It has the pixel pattern restoration step (ST1115-ST1118 of drawing 16) which restores the pixel pattern before the compression in said 1 compression unit (either of CU01* - CU04*).

[0042] In order to attain the 3rd purpose of the above, the system of this invention The inside of the information aggregate (drawing 9 PXD; drawing 10 SPD) which two or more pixel data defined by two or more bit number (for example, 2 bits) gather, and is formed, The data block which the same pixel data follow is compressed as 1 compression unit (for example, CU01-CU04 of drawing 9) (ST806 of drawing 13). The compressed bit string is elongated and it is constituted combining the following encoding processing and the following decoding (ST1005 of drawing 15). namely, (**) -- with the coding header (for example, 0-6 bits in the regulations 1-4 of drawing 5) corresponding to the number of the same pixel data continuation in the data block of said 1 compression unit (for example, 1-255) With the number data of continuation pixels (for example, 2-8 bits) in which this number of the same pixel data continuation (1-255) is shown, and the data (2 bits) in which the same pixel data in the data block of said 1 compression unit itself are shown encoding processing; containing the step (ST806 of drawing 13) which generates the compressed unit data block (for example, CU01*-CU04* of drawing 9), and (b) -- by said encoding processing From the data block of said 1 generated compression unit (either of CU01* - CU04*) Said number data of continuation pixels (2-8 bits), Or the coding header fetch step which takes out said coding header which points out the aggregate of said number data of continuation pixels (2-8 bits), and said same pixel data (2 bits) (ST1101-ST1109 of drawing 16); After taking out said coding header, The number fetch step of continuation pixels which takes out said number data of continuation pixels of this data block (2-8 bits) (ST1110-ST1113 of drawing 16); from the data block of said 1 compression unit (either of CU01* - CU04*) The coding header taken out in said coding header fetch step (ST1101-ST1109) (0-6 bits; with [when the data length of a header is 0 bit / a total result] no effect), It is based on remaining (for example, 2 bits of the pixel data in the regulations 1-4 of drawing 5). the number data of continuation pixels (2-8 bits) taken out in said number fetch step of continuation pixels (ST1110-ST1113) were deducted -- The pixel data decision step which determines the contents (00, 01, 10, 11) of the pixel data before the compression which constituted the data block of said 1 compression unit (either of CU01* - CU04*) (ST1114 of drawing 16); by said pixel data decision step (ST1114) It arranges by the bit length the number data of continuation pixels (2-8 bits) taken out in said number fetch step of continuation pixels (ST1110-ST1113) indicate the bit data of the determined contents to be. Decoding containing the pixel pattern restoration step (ST1115-ST1118 of drawing 16) which restores the pixel pattern before the compression in said 1 compression unit (either of CU01* - CU04*).

[0043] In order to attain the 4th purpose of the above, the computer program of this invention In what compresses the data block which the same pixel data follow among the information aggregates which two or more pixel data defined by the predetermined number of bits gather, and are formed as 1 compression unit The compressed data specification procedure of specifying the data block of said 1 compression unit among said information aggregates; The coding header corresponding to the number of the same pixel data continuation in the data block of said 1 compression unit, With the number data of continuation pixels in which this number of the same pixel data continuation is shown, and the data in which the same pixel data in the data block of said 1 compression unit itself are shown The compressed data generation procedure which generates the compressed unit data block; according to the data length of the number of the same pixel data continuation in the data block of said 1 compression unit, it is constituted including the procedure of changing the bit pattern of said coding header.

[0044] Or the computer program of this invention The inside of the information aggregate which two or more pixel data defined by the predetermined number of bits gather, and is formed, It is what elongates the bit string compressed considering the data block which the same pixel data follow as one unit.

[when said data block contains the coding header which points out the number data of continuation pixels corresponding to the number of continuation of said same pixel data or said same pixel data, and its number data of continuation pixels] The coding header fetch procedure which takes out said (ST1101-ST1107 of drawing 16) coding header from the data block of said 1 compression unit by 2 bitwises among said information aggregates; It is based on the contents of the coding header taken out in said coding header fetch procedure. The number fetch procedure of continuation pixels which takes out said number data of continuation pixels from the data block of said 1 compression unit; The coding header taken out from the data block of said 1 compression unit in said coding header fetch procedure, It is based on the remainder which deducted the number data of continuation pixels taken out in said number fetch procedure of continuation pixels. The pixel data decision procedure which determines the contents of the pixel data before the compression which constituted the data block of said 1 compression unit; the bit data of the contents determined by said pixel data decision procedure It arranges by the bit length which the number data of continuation pixels taken out in said number fetch procedure of continuation pixels show, and is constituted including the pixel pattern restoration procedure which restores the pixel pattern before the compression in said 1 compression unit.

[0045] In order to attain the 5th purpose of the above, the encoding equipments (integrated circuit device with which the encoding approach of the 1st purpose is performed inside) of this invention The inside of the information aggregate (PXD/SPD) which two or more pixel data defined by two or more bit number (for example, 2 bits) gather, and is formed, In what compresses the data block which the same pixel data follow as 1 compression unit (for example, CU01-CU04 of drawing 9) The inside of said information aggregate (PXD/SPD), A compressed data specification means to specify the data block of said 1 compression unit (CU01-CU04) (ST801 of drawing 13); It corresponds to the number of the same pixel data continuation in the data block of said 1 compression unit (for example, 1-255). The coding header of the changing bit pattern (for example, 0-6 bits in the regulations 1-4 of drawing 5), With the number data of continuation pixels (for example, 2-8 bits) in which this number of the same pixel data continuation (1-255) is shown, and the data (2 bits) in which the same pixel data in the data block of said 1 compression unit itself are shown It has a compressed data generation means (ST806 of drawing 13 ; ST908-ST914 of drawing 14) to generate the compressed unit data block (for example, CU01*-CU04* of drawing 9).

[0046] In order to attain the 6th purpose of the above, the decoding equipments (integrated circuit device with which the decoding approach of the 2nd purpose is performed inside) of this invention The inside of the information aggregate (drawing 9 PXD; drawing 10 SPD) which two or more pixel data defined by the predetermined number of bits (for example, 2 bits) gather, and is formed, It is what elongates the bit string compressed considering the data block which the same pixel data follow as one unit (ST1005 of drawing 15). [when said data block contains the coding header which points out the number data of continuation pixels corresponding to the number of continuation of said same pixel data or said same pixel data, and its number data of continuation pixels] Among said information aggregates (PXD/SPD) from the data block of said 1 compression unit (for example, either of CU01* - CU04*) The coding header fetch means which takes out said coding header by 2 bitwises (103 of drawing 11 ; ST1101-ST1107 of drawing 16); In said coding header fetch means (ST1101-ST1109) It is based on the contents (for example, 0-6 bits in the regulations 1-4 of drawing 5) of the taken-out coding header. From the data block of said 1 compression unit (either of CU01* - CU04*) The number fetch means of continuation pixels which takes out said number data of continuation pixels of this data block (for example, 2-8 bits) (106+107 of drawing 11 ; ST1110-ST1113 of drawing 16); from the data block of said 1 compression unit (either of CU01* - CU04*) The coding header taken out in said coding header fetch means (ST1101-ST1109) (0-6 bits), It is based on remaining (for example, 2 bits of the pixel data in the regulations 1-4 of drawing 5). the number data of continuation pixels (2-8 bits) taken out in said number fetch means of continuation pixels (ST1110-ST1113) were deducted -- Said 1 compression unit A pixel data decision means to determine the contents (00, 01, 10, 11) of the pixel data before the compression which constituted (one) data block of CU01* - CU04* (110+112 of drawing 11 ; ST1114 of drawing 16); with said pixel data decision means (ST1114) It arranges by the bit length the number data of continuation pixels (2-8 bits) taken out in said number fetch means of continuation pixels (ST1110-ST1113) indicate the bit data of the determined contents to be. It has a pixel pattern restoration means (104 of drawing 11 ; ST1115-ST1118 of drawing 16) to restore the pixel pattern before the compression

in said 1 compression unit (either of CU01* - CU04*).
[0047] In order to attain the 7th purpose of the above, the recording device of this invention The inside of the information aggregate (PXD/SPD) which two or more pixel data defined by two or more bit number (for example, 2 bits) gather, and is formed, In what compresses the data block which the same pixel data follow as 1 compression unit (for example, CU01-CU04 of drawing 9), and records the compressed information The coding header of the bit pattern which changes corresponding to the number of the same pixel data continuation in the data block of said 1 compression unit (for example, 1-255) (for example, 0-6 bits in the regulations 1-4 of drawing 5), With the number data of continuation pixels (for example, 2-8 bits) in which this number of the same pixel data continuation (1-255) is shown, and the data (for example, 2 bits) in which the same pixel data in the data block of said 1 compression unit itself are shown A compressed data generation means to generate the compressed unit data block (for example, CU01*-CU04* of drawing 9) (200 of drawing 18 ; ST806; of drawing 13 ST908-ST914 of drawing 14); with said compressed data generation means (200) It has a record means (702-704 of drawing 18) to record the generated compression unit data block (CU01*-CU04* of drawing 9) on a predetermined record medium (OD of drawing 18).
[0048] In order to attain the 8th purpose of the above, the regenerative apparatus of this invention From the record medium (OD) with which the information aggregate (PXD/SPD) which two or more pixel data defined by the predetermined number of bits (for example, 2 bits) gather, and is formed was recorded It is what reproduces the bit string compressed considering the data block which the same pixel data follow as one unit, and is elongated (ST1005 of drawing 15). [when said data block contains the coding header which points out the number data of continuation pixels corresponding to the number of continuation of said same pixel data or said same pixel data, and its number data of continuation pixels] Among said information aggregates (PXD/SPD) from the data block of said 1 compression unit (either [for example,] CU01* of drawing 9 - CU04*) The coding header fetch means which takes out said coding header by 2 bitwises (103 of drawing 11 ; ST1101-ST1107 of drawing 16); In said coding header fetch means (ST1101-ST1109) It is based on the contents (for example, 0-6 bits in the regulations 1-4 of drawing 5) of the taken-out coding header. From the data block of said 1 compression unit (either of CU01* - CU04*) The number fetch means of continuation pixels which takes out said number data of continuation pixels of this data block (for example, 2-8 bits) (106+107 of drawing 11 ; ST1110-ST1113 of drawing 16); from the data block of said 1 compression unit (either of CU01* - CU04*) The coding header taken out in said coding header fetch means (ST1101-ST1109) (for example, 0-6 bits), It is based on remaining (for example, 2 bits of the pixel data in the regulations 1-4 of drawing 5). the number data of continuation pixels (2-8 bits) taken out in said number fetch means of continuation pixels (ST1110-ST1113) were deducted -- Said 1 compression unit A pixel data decision means to determine the contents (00, 01, 10, 11) of the pixel data before the compression which constituted (one) data block of CU01* - CU04* (110+112 of drawing 11 ; ST1114 of drawing 16); with said pixel data decision means (ST1114) It arranges by the bit length the number data of continuation pixels (2-8 bits) taken out in said number fetch means of continuation pixels (ST1110-ST1113) indicate the bit data of the determined contents to be. It has a pixel pattern restoration means (104 of drawing 11 ; ST1115-ST1118 of drawing 16) to restore the pixel pattern before the compression in said 1 compression unit (either of CU01* - CU04*).
[0049] In order to attain the 9th purpose of the above, the broadcast system of this invention The inside of the information aggregate (drawing 9 PXD; drawing 10 SPD) which two or more pixel data defined by the predetermined number of bits (for example, 2 bits) gather, and is formed, It is what compresses the data block which the same pixel data follow as 1 compression unit (for example, CU01-CU04 of drawing 9). The coding header of the bit pattern which changes corresponding to the number of the same pixel data continuation in the data block of said 1 compression unit (for example, 1-255) (for example, 0-6 bits in the regulations 1-4 of drawing 5), With the number data of continuation pixels (for example, 2-8 bits) in which this number of the same pixel data continuation (1-255) is shown, and the data (2 bits) in which the same pixel data in the data block of said 1 compression unit itself are shown The encoder which generates the compressed unit data block (for example, CU01*-CU04* of drawing 9) (ST806 of drawing 13 ; ST908-ST914 of drawing 14) (200 of drawing 10); with said encoder A means (210 212) to broadcast the signal containing the generated compression unit data block (CU01*-CU04* of drawing 9) through wireless or a cable is provided.

[0050] Or the inside of the information aggregate (PXD/SPD) with which two or more pixel data with which the broadcast system of this invention is defined by the predetermined number of bits (for example, 2 bits) gather, and are formed, The data block which the same pixel data follow is compressed as 1 compression unit (for example, CU01-CU04 of drawing 9). The coding header of the bit pattern which changes corresponding to the number of the same pixel data continuation in the data block of said 1 compression unit (for example, 1-255) (for example, 0-6 bits in the regulations 1-4 of drawing 5), The number data of continuation pixels in which this number of the same pixel data continuation (1-255) is shown (for example, 2-8 bits), A digital signal generating means to generate the digital signal containing the data (2 bits) in which the same pixel data in the data block of said 1 compression unit itself are shown (300 of drawing 22); with said digital signal generating means A means (210 212) to broadcast said generated digital signal through wireless or a cable is provided.
[0051] In order to attain the 10th purpose of the above, the electronic mail system or telecommunications system of this invention The inside of the information aggregate (drawing 9 PXD; drawing 10 SPD) which two or more pixel data defined by the predetermined number of bits (for example, 2 bits) gather, and is formed, It is what compresses the data block which the same pixel data follow as 1 compression unit (for example, CU01-CU04 of drawing 9). The coding header of the bit pattern which changes corresponding to the number of the same pixel data continuation in the data block of said 1 compression unit (for example, 1-255) (for example, 0-6 bits in the regulations 1-4 of drawing 5), With the number data of continuation pixels (for example, 2-8 bits) in which this number of the same pixel data continuation (1-255) is shown, and the data (2 bits) in which the same pixel data in the data block of said 1 compression unit itself are shown A compressed data (ST806 of drawing 13 ; ST908-ST914 of drawing 14) generation means to generate the compressed unit data block (for example, CU01*-CU04* of drawing 9) (5001-5031 of drawing 23); with said compressed data generation means A transmitting means to transmit the signal containing the generated compression unit data block (CU01*-CU04*) (5031 600); with said transmitting means A receiving means to receive the transmitted compression unit data block (CU01*-CU04*) (503Ns of drawing 23); with said receiving means Said coding header is extracted from the received compression unit data block (CU01*-CU04*) (ST1101-ST1107 of drawing 16). The location of said continuation pixel data is determined from the contents of the extracted coding header (ST1110-ST1113). Said pixel data following said continuation pixel data and it are extracted from the determined location (ST1114). A data (ST1115-ST1118) restoration means (501N-503N of drawing 23) to restore said 1 compression unit data block before being compressed by said compressed data generation means is provided.
[0052] By the encoding approach of this invention, three or more kinds of pixel data are compressed among the regulations 1-6 shown below based on regulations 2-4 at least. It explains taking the case of the case where the pixel data in which each pixel dot is shown consist of 2 bits hereafter.
[0053] When 1-3 <regulation 1> same pixel data continue: Let 2 bits which expresses the number of continuation pixels with 2 bits of the beginning, and continues by them be pixel data (picture compression data PXD) by making 4 bits into one unit.
[0054] If the number of <example> same continuation pixels (for example, 11) is one and that of PXD=01 and 11 same continuation pixels (for example, 10) is two If the number of PXD=10 and 10 same continuation pixels (for example, 00) is three, when 4-15 PXD=11 and the 00 <regulation 2> same pixel data continue : 8 bits (cutting tool) are made into one unit. 2 bits of the beginning are set to "00", and the number of continuation pixels is expressed with the next 4 bits, and let the next 2 bits be pixel data.
[0055] If the number of <example> same continuation pixels (for example, 01) is five, when 16-63 PXD=00, 0101, and the 01 <regulation 3> same pixel data continue: 4 bits of the beginning are set to "0000" by making 12 bits into one unit, and the number of continuation pixels is expressed with the next 6 bits, and let the next 2 bits be pixel data.
[0056] If the number of <example> same continuation pixels (for example, 10) is 16 and that of PXD=0000, 010000, and 10 same continuation pixels (for example, 11) is 46, when 64-255 PXD=0000, 101110, and the 11 <regulation 4> same pixel data continue: 6 bits of the beginning are set to "000000" by making 16 bits into one unit, and the number of continuation pixels be expressed with the next 8 bits and let the next 2 bits be pixel data
[0057] If the number of <example> same continuation pixels (for example, 01) is 255, when the same

pixel data continue to the end of PXD=000000-11111111-01 <a regulation 5 (pixel data stream which is going to carry out run length coding)> Rhine: Set 14 bits of the beginning to "00000000000000" by making 16 bits into one unit, and let the next 2 bits be pixel data.
[0058] When a cutting tool aryne is not carried out at the time of PXD=00000000000000, and 11< regulation termination of 6> 1 line if a <example> same continuation pixel (for example, 00) continues to the end of Rhine, and PXD=00000000000000 and a 00 same continuation pixel (for example, 11) continue to the end of Rhine, 4-bit dummy data "0000" is inserted (at tail of the compressed data for one line).
[0059] <example> [-- 0 / 1 data stream -- integral multiple-4-bit] of 8, and 0000 -- by the decoding approach of this invention, the original data before encoding are restored by carrying out the twist operations of the above-mentioned encoding regulation.
[0060]
[Embodiment of the Invention] Hereafter, with reference to a drawing, the encoding approach and the decoding approach concerning the gestalt of 1 implementation of this invention are explained. In addition, in order to avoid duplication explanation, the common reference mark is used for the part which is common on a function over two or more drawings.
[0061] Drawing 1 - drawing 27 are drawings for explaining encoding/decoding system of the image information concerning the gestalt of 1 implementation of this invention.
[0062] Drawing 1 sketches the record DS of optical disk OD as an example of the information maintenance medium which can apply this invention.
[0063] This optical disk OD is a double-sided lamination disk with the amount of storage capacity of about 5 G bytes of one side, and many recording tracks are arranged from the lead-in groove area by the side of disk inner circumference before the lead-out area by the side of a disk periphery. Each truck consists of many logical sectors, and various information (digital data compressed suitably) is stored in each sector.
[0064] Drawing 2 has illustrated the logical structure of the data recorded on the optical disk of drawing 1 . That is, the system area which stores the system data used by Disk OD, and volume-management information area and multi-file area are formed into the aggregate of two or more logical sectors of drawing 1 .
[0065] The file 1 includes the main image information (VIDEO in drawing), the subimage information (SUB-PICTURE in drawing) which has auxiliary contents to the main image, speech information (AUDIO in drawing), playback information (PLAYBACK INFO. in drawing), etc. among the above-mentioned multiple-files area.
[0066] Drawing 3 has illustrated the logical structure of the pack of the subimage information encoded among the DS illustrated by drawing 2 (run length compression).
[0067] As shown in the upper part of drawing 3 , one pack of the subimage information included in a video data consists of 2048 bytes. One pack of this subimage information contains one or more subimage packets after the header of a top pack. The 1st subimage packet contains the subimage data (SP DATA1) by which run length compression was carried out after the header of the packet. Similarly, the 2nd subimage packet contains the subimage data (SP DATA2) by which run length compression was carried out after the header of the packet.
[0068] The sub-imaging unit header 31 is given to the thing 30 which collected such two or more subimage data (SP DATA1, SP DATA2, --) by 1 of run length compression unit (one unit), i.e., a subimage data unit. After this sub-imaging unit header 31, the pixel data 32 which carried out run length compression of the image data for one unit (for example, data for 1 level Rhine of a two-dimensional display screen) continue.
[0069] A paraphrase forms the run length compressed data 30 for one unit by the assembly for subimage data division (SP DATA1, SP DATA2, --) of one or more subimage packets. This subimage data unit 30 consists of a sub-imaging unit header 31 on which the various parameters for subgraphic display are recorded, and an indicative data (compressed pixel data) 32 which consists of a run length sign.
[0070] Drawing 4 has illustrated the contents of the sub-imaging unit header 31 among the run length compressed data 30 for one unit illustrated by drawing 3 . Here, the data of the subimage (for example, title corresponding to the scene of the movie of the main image) recorded and transmitted (communication link) are explained with the main image (for example, image body of a movie).

[0071] As shown in drawing 4 , to the sub-imaging unit header 31 Starting address SPDDADR of the pixel data (indicative data) 32 of a subimage, The display starting position and display rectangle SPDSIZE (width of face and height) on ending-address SPEDADR of the pixel data 32, and TV screen of the pixel data 32 The subimage color SPCINFO specified from the background color SPCHI specified from the system, and the system The pallet color number number SPADJINFO of the emphasis color specified from the system the mixing ratio of the subimage (SP) over the qualification information SPMOD and the main image (MP) of the subimage pixel data 32 -- with SPCONT The initiation timing (it corresponds to the frame number of the main image) SPDST of a subimage, and the starting address SPLine1 of the decoding data of each Rhine of every - SPlineN are recorded.
[0072] : (1) on which various parameters (SPDDADR etc.) having the following contents in the sub-imaging unit header 31, speaking a little more concretely, as shown in the lower part of drawing 4 are recorded -- the starting address information (SPDDADR: relative address from the head of a header) on the indicative data (pixel data of a subimage) following this header, and;
(2) Ending-address information on this indicative data (SPEDADR: relative address from the head of a header);
(3) Information which shows the display starting position and display rectangle (width of face and height) on the monitor display of this indicative data (SPDSIZE);
(4) Information which shows the background color (number of 16 color color palette set up with the story information table or the display-control sequence table) specified by the system (SPCHI);
(5) Information which shows the subimage color (number of 16 color color palette set up with the story information table or the display-control sequence table) specified by the system (SPCINFO);
(6) Information which shows the subimage emphasis color (number of the color palette set up with the story information table or the display-control sequence table) specified by the system (SPAJDNFO);
(7) Subimage image mode information which it is specified by the system and shows non-interlaced field mode, the frame mode of an interlace, etc. (SPMOD); (when the pixel data for compression consist of various the numbers of bits, it can specify what bit configuration pixel data are from the contents of this mode information.)
(8) Information which shows the mixing ratio of the subimage specified by the system, and the main image (SPCONT);
(9) Information which shows the display initiation timing of a subimage with the frame number (for example, I picture frame number of MPEG) of the main image (SPDST);
(10) Information which shows the starting address (relative address from the head of a sub-imaging unit header) of the coded data of the 1st line of a subimage (SPlin1);
(11) Information which shows the starting address (relative address from the head of a sub-imaging unit header) of the coded data of eye N Rhine of a subimage (SPlinN).
[0073] In addition, the information SPCONT which shows the mixing ratio of the above-mentioned subimage and the main image expresses the mixing ratio of a subimage by a (system construction value) / 255, and expresses the mixing ratio of the main image by the (255-set point) / 255.
[0074] The starting address (SPLine1 - SPlineN) of the decoding data of each Rhine of every exists in this sub-imaging unit header 31. For this reason, scrolling of only the subimage in the display screen is realizable by changing assignment of decoding initiation Rhine with the directions from the microcomputer by the side of a decoder (MPU or CPU) etc. (-- about this scrolling, it mentions later with reference to drawing 21 .) -- in time, a subimage can record now the field/frame mode (SPMOD) which shows how it corresponds to TV field / frame of NTSC system on the sub-imaging unit header 31.

[0075] Usually, bit"0" is written in this field / frame mode Records Department (SPMOD). In the decoder side which received such a subimage data unit 30, it is judged by this bit"0" that it is a frame mode (non-interlaced mode), and the code data which received is decoded for every Rhine. Then, an image so that it may illustrate freely which was decoded at the lower left of drawing 8 is outputted from a decoder, and this is displayed on the display screen like a monitor or television (TV).
[0076] On the other hand, when bit"1" is written in the field / frame mode Records Department (SPMOD), it judges with a decoder side being in field mode (interlace mode). In this case, after code data is decoded for every Rhine, the consecutive output of the same data is carried out by two lines so that it may illustrate at the lower right of drawing 8 . Then, the screen corresponding to the interlace

mode of TV is obtained. Thereby, although image quality becomes rude rather than a frame mode (non-interlaced mode), the image of the twice as many amount as this can be displayed by the same amount of data as a frame mode.

[0077] The data length (variable length) of the one unit is decided by whether which regulation of the run length compression regulations 1-6 which show the pixel data (run length data) 32 of the subimage shown in drawing 3 or drawing 4 in drawing 5 or drawing 6 , or the run length compression regulations 11-15 is applied. And encoding (run length compression) and decoding (run length elongation) are performed with the regular data length.

[0078] The regulations 1-6 of drawing 5 are used when the pixel data for compression are two or more bit configuration (here 2 bits), and the regulations 11-15 of drawing 6 are used when the pixel data for compression are 1 bit pattern.

[0079] It can be decided according to the contents (bit width-of-face flag etc.) of the parameter SPMOD in the sub-imaging unit header 31 (refer to near the center of the table of the lower part of drawing 4) which shall be used between the run length compression regulations 1-6 or the run length compression regulations 11-15. For example, when the bit width-of-face flag of Parameter SPMOD is "1", the pixel data for run length compression are 2 bit data, and the regulations 1-6 of drawing 5 are used. On the other hand, when the bit width-of-face flag of Parameter SPMOD is "0", the pixel data for run length compression are 1 bit data, and the regulations 11-15 of drawing 6 are used.

[0080] When pixel data can take 1, 2, 3, or 4 bit patterns now, it is assumed that four kinds of compression regulation groups A, B, C, and D are prepared corresponding to these bit pattern values. in this case, the parameter SPMOD -- a 2-bit flag -- carrying out -- a flag -- the 1-bit pixel data which use the regulation group A by "00" -- specifying -- a flag -- the 2-bit pixel data which use the regulation group B by "01" -- specifying -- a flag -- the triplet pixel data which use the regulation group C by "10" -- specifying -- a flag -- the 4-bit pixel data which use the regulation group D by "11" can be specified. Here, the regulations 11-15 of drawing 6 can be used for the compression regulation group A, and the regulations 1-6 of drawing 5 can be used for the compression regulation B. The compression regulation groups C and D are changing suitably the configuration bit value and the number of regulations of the coding header of drawing 5 , the number of continuation pixels, and pixel data, and are obtained.

[0081] Drawing 5 explains the run length compression regulations 1-6 adopted by the encoding approach concerning the gestalt of 1 implementation of this invention, when subimage pixel data (run length data) 32 part illustrated by drawing 4 consists of two or more bits (here 2 bits) pixel data.

[0082] Moreover, drawing 9 is drawing for explaining concretely the above-mentioned compression regulations 1-6, when subimage pixel data (run length data) 32 part illustrated by drawing 4 consists of pixel data which are 2 bits.

[0083] When the 1-3 same pixels continue, 4 bit data constitute data 1 unit of encoding (run length compression) from the regulation 1 shown in eye 1 of drawing 5 train. In this case, the number of continuation pixels is expressed with 2 bits of the beginning, and pixel data (color information on a pixel etc.) are expressed with the next 2 bits.

[0084] For example, the compressed data unit CU 01 of the beginning of the image data PXD before the compression shown in the upper part of drawing 9 contains two 2-bit pixel data d0 and d1=(0000) b (b points out a binary thing). In this example, the same 2-bit pixel data (00) b are carrying out two-piece continuation (continuation).

[0085] In this case, as shown in the lower part of drawing 9 , 2 fatbits [of the number of continuation "2"] (10) b, and d0 and d1=(1000) b which connected the contents (00) b of pixel data become data unit CU01* of the image data PXD after compression.

[0086] If it puts in another way, b (0000) of data unit CU01 will be changed into b (1000) of data unit CU01* under a regulation 1. although compression of substantial bit length is not obtained in this example, the three same pixels (00) b continue, for example -- if it CU01=(000000) b becomes, after compression will be set to CU01*=(1100) b, and the 2-bit compression effectiveness will be acquired.

[0087] When the 4-15 same pixels continue, 8 bit data constitute data 1 unit of encoding from the regulation 2 shown in eye 2 of drawing 5 trains. In this case, the coding header which shows that it is based on a regulation 2 by 2 bits of the beginning is expressed, the number of continuation pixels is expressed with the next 4 bits, and pixel data are expressed with 2 bits of after that.

[0088] For example, the 2nd compressed data unit CU 02 of the image data PXD before the compression

shown in the upper part of drawing 9 contains five 2-bit pixel data d2, d3, d4, and d5 and d6= (0101010101) b. In this example, the same 2-bit pixel data (01) b are carrying out five-piece continuation (continuation).

[0089] In this case, as shown in the lower part of drawing 9 , the coding header (00) b, 4 fatbits (0101) b of the number of continuation "5", and d2 which connected the contents (01) b of pixel data - d6= (00010101) b become data unit CU02* of the image data PXD after compression.

[0090] If it puts in another way, b (0101010101) (10 bit length) of data unit CU02 will be changed into b (00010101) (8 bit length) of data unit CU02* under a regulation 2. In this example, although there is only the amount of [8 bits 2 bits] substantial bit length compression from 10 bits, this serves as compressed data (CU02*=00111101) whose number of continuation is 8 bits in the case of 15 (it is 30 bit length since 15 01 of CU02 continues), and the 22-bit compression effectiveness is acquired to 30 bits. That is, the bit compression effectiveness based on a regulation 2 is larger than the thing of a regulation 1. However, a regulation 1 is also needed in order to correspond to run length compression of a detailed image with high resolution.

[0091] When the 16-63 same pixels continue, 12 bit data constitute data 1 unit of encoding from the regulation 3 shown in eye 3 of drawing 5 trains. In this case, the coding header which shows that it is based on a regulation 3 by 4 bits of the beginning is expressed, the number of continuation pixels is expressed with the next 6 bits, and pixel data are expressed with 2 bits of after that.

[0092] For example, the 3rd compressed data unit CU 03 of the image data PXD before the compression shown in the upper part of drawing 9 contains 16 2-bit pixel data d7 - d22=(101010.....1010) b. In this example, the same 2-bit pixel data (10) b are carrying out 16-piece continuation (continuation).

[0093] In this case, as shown in the lower part of drawing 9 , the coding header (0000) b, 6 fatbits (010000) b of the number of continuation "16", and d7 which connected the contents (10) b of pixel data - d22=(000001000010) b become data unit CU03* of the image data PXD after compression.

[0094] If it puts in another way, b (101010.....1010) (32 bit length) of data unit CU03 will be changed into b (000001000010) (12 bit length) of data unit CU03* under a regulation 3. Although the amount of substantial bit length compression is 12 bits 20 bits from 32 bits in this example, this serves as compressed data (CU03*=000011111110) whose number of continuation is 12 bits in the case of 63 (it is 126 bit length since 63 10 of CU03 continues), and the 114-bit compression effectiveness is acquired to 126 bits. That is, the bit compression effectiveness based on a regulation 3 is larger than the thing of a regulation 2.

[0095] When the 64-255 same pixels continue, 16 bit data constitute data 1 unit of encoding from the regulation 4 shown in eye 4 of drawing 5 trains. In this case, the coding header which shows that it is based on a regulation 4 by 6 bits of the beginning is expressed, the number of continuation pixels is expressed with the next 8 bits, and pixel data are expressed with 2 bits of after that.

[0096] For example, the 4th compressed data unit CU 04 of the image data PXD before the compression shown in the upper part of drawing 9 contains 69 2-bit pixel data d23 - d91=(111111.....1111) b. In this example, the same 2-bit pixel data (11) b are carrying out 69-piece continuation (continuation).

[0097] In this case, as shown in the lower part of drawing 9 , the coding header (000000) b, 8 fatbits (00100101) b of the number of continuation "69", and d23 which connected the contents (11) b of pixel data - d91=(0000000010010111) b become data unit CU04* of the image data PXD after compression.

[0098] If it puts in another way, b (111111.....1111) (138 bit length) of data unit CU04 will be changed into b (0000000010010111) (16 bit length) of data unit CU04* under a regulation 4. Although the amount of substantial bit length compression is 16 bits 122 bits from 138 bits in this example, this serves as compressed data (CU04*=0000001111111111) whose number of continuation is 16 bits in the case of 255 (it is 510 bit length since 255 11 of CU01 continues), and the 494-bit compression effectiveness is acquired to 510 bits. That is, the bit compression effectiveness based on a regulation 4 is larger than the thing of a regulation 3.

[0099] When the same pixel continues from the switching point of an encoding data unit to the end of Rhine, 16 bit data constitute data 1 unit of encoding from the regulation 5 shown in eye 5 of drawing 5 trains. In this case, the coding header which shows that it is based on a regulation 5 by 14 bits of the beginning is expressed, and pixel data are expressed with the next 2 bits.

[0100] For example, the 5th compressed data unit CU 05 of the image data PXD before the compression shown in the upper part of drawing 9 contains one or more 2-bit pixel data d92 - dn=(000000.....0000)

b. Although the same 2-bit pixel data (00) b are carrying out finite individual continuation (continuation) in this example, the number of continuation pixels is [one or more] good without limit under a regulation 5.

[0101] In this case, as shown in the lower part of drawing 9 , d92 which connected the contents (00) b of the coding header (00000000000000) b and pixel data - dn=(0000000000000000) b become data unit CU05* of the image data PXD after compression.

[0102] If it puts in another way, b (000000.....0000) (unspecified bit length) of data unit CU05 will be changed into b (0000000000000000) (16 bit length) of data unit CU05* under a regulation 5. Under a regulation 5, if there are Rhine and the 16 or more bit length of the numbers of the same pixel continuation of until, the compression effectiveness will be acquired.

[0103] Under the regulation 6 shown in eye 6 of drawing 5 trains, when pixel Rhine of one line where the data for encoding were located in a line is completed and the die length of the compressed data PXD for one line is not the integral multiple which is 8 bits (that is, it is not a cutting tool aryne), 4-bit dummy data is added and it is carrying out as [become / the compressed data PXD for one line / per cutting tool] (that is, a cutting tool aryne is carried out like).

[0104] For example, although the sum total bit length of data unit CU01* of the image data PXD after the compression shown in the lower part of drawing 9 - CU05* is surely a 4-bit integral multiple, it is not necessarily a 8-bit integral multiple.

[0105] For example, if 4 bits runs short in order that the sum total bit length of data unit CU01* - CU05* may be 1020 bits and may consider as a cutting tool aryne, as shown in the lower part of drawing 9 , 4-bit dummy data CU06*=(0000) b will be added to a 1020-bit tail, and 1024-bit data unit CU01* by which the cutting tool aryne was carried out - CU06* will be outputted.

[0106] In addition, 2-bit pixel data are not necessarily limited to what displays four kinds of pixel colors. For example, the pixel data (00) b express the background pixel of a subimage, the pixel data (01) b express the pattern pixel of a subimage, the pixel data (10) b express the 1st emphasis pixel of a subimage, and you may make it the pixel data (11) b express the 2nd emphasis pixel of a subimage.

[0107] If there is more configuration number of bits of pixel data, the subimage pixel of other types can be specified more. For example, when pixel data consist of b (000)-(111) b of a triplet, in the subimage data decoded [which are decoded and are run-length-encoded], a maximum of eight kinds of pixel color + pixel classes (enhancement effect) can be specified.

[0108] Drawing 6 explains the run length compression regulations 11-15 adopted by the encoding approach concerning the gestalt of other implementation of this invention, when subimage pixel data (run length data) 32 part illustrated by drawing 4 consists of pixel data which are 1 bit.

[0109] When the 1-7 same pixels continue, 4 bit data constitute data 1 unit of encoding (run length compression) from the regulation 11 shown in eye 1 of drawing 6 train. In this case, the number of continuation pixels is expressed with the first triplet, and pixel data (information on a pixel class etc.) are expressed with the next 1 bit. For example, if 1-bit pixel data are "0", the background pixel of a subimage is shown, and if it is "1", the pattern pixel of a subimage is shown.

[0110] When the 8-15 same pixels continue, 8 bit data constitute data 1 unit of encoding from the regulation 12 shown in eye 2 of drawing 6 trains. In this case, the coding header (for example, 000) which shows that it is based on a regulation 12 is expressed with the first triplet, the number of continuation pixels is expressed with the next 4 bits, and pixel data are expressed with 1 bit of after that.

[0111] When the 16-127 same pixels continue, 12 bit data constitute data 1 unit of encoding from the regulation 13 shown in eye 3 of drawing 6 trains. In this case, the coding header (for example, 0000) which shows that it is based on a regulation 13 by 4 bits of the beginning is expressed, the number of continuation pixels is expressed with the next 7 bits, and pixel data are expressed with 1 bit of after that.

[0112] When the same pixel continues from the switching point of an encoding data unit to the end of Rhine, 8 bit data constitute data 1 unit of encoding from the regulation 14 shown in eye 4 of drawing 6 trains. In this case, the coding header (for example, 0000000) which shows that it is based on a regulation 14 by 7 bits of the beginning is expressed, and pixel data are expressed with the next 1 bit.

[0113] Under the regulation 15 shown in eye 5 of drawing 6 trains, when pixel Rhine of one line where the data for encoding were located in a line is completed and the die length of the compressed data PXD for one line is not the integral multiple which is 8 bits (that is, it is not a cutting tool aryne), 4-bit dummy data is added and it is carrying out as [become / the compressed data PXD for one line / per

cutting tool] (that is, a cutting tool aryne is carried out like).
[0114] Next, with reference to drawing 7 , the image coding approach (the encoding approach using run length compression coding) is explained concretely.
[0115] the pixel data which constitute the subimage pixel data (run length data) 32 which illustrated drawing 7 by drawing 4 -- for example, the 1- it consisted of the 9th line, the pixel (it has a maximum of four kinds of contents) of 2 bit patterns is located in a line on each Rhine, and the case where a character pattern "A" and "B" are expressed by the 2-bit pixel on each Rhine is shown. In this case, the pixel data of each Rhine explain concretely how it is encoded (run length compression).
[0116] The image used as the source consists of three kinds (a maximum of four kinds) of pixel data so that it may illustrate in the upper part of drawing 7 . That is, the pixel color of the background of a subimage is shown by 2-bit image data (00) b, the alphabetic character within a subimage "A" and the pixel color of "B" are shown by 2-bit image data (01) b, and the subimage alphabetic character "A" and the emphasis pixel color to "B" are shown by 2-bit image data (10) b.
[0117] If the subject-copy image containing an alphabetic character "A" and "B" is scanned with a scanner etc., these character patterns will be read in the left per 1 pixel toward the right for every scan line. In this way, the read image data are inputted into the encoder (the operation gestalt of drawing 10 mentioned later 200) which performs run length compression based on this invention.
[0118] This encoder can consist of microcomputers (MPU or CPU) with which the software which performs run length compression based on the regulation 1 - the regulation 6 of having explained by drawing 5 operates. About this encoder software, it mentions later with reference to the flow chart of drawing 13 and drawing 14 .
[0119] Hereafter, the character pattern "A" read per 1 pixel and the encoding processing of "B" which carries out run length compression of the bit string one by one (sequential) are explained.
[0120] Since the case where the pixel color of a source image is three is assumed, the image data (a character pattern "A" and sequential bit string of "B") of an encoding processing object express a background pixel color "-" with the example of drawing 7 by the 2-bit pixel data (00) b, express an alphabetic character pixel color "#" with it by the 2-bit pixel data (01) b, and express the emphasis pixel color "o" with it by the 2-bit pixel data (10) b. The number of bits (= 2) of these pixel data (00, 01, etc.) may be called pixel width of face.
[0121] In addition, for simplification, in the example of drawing 7 , display width of face of encoding processing-object image data (subimage data) is made into 16 pixels, and the number of scan lines (height of a display) is made into nine lines.
[0122] First, the pixel data (subimage data) obtained from the scanner are once changed into the run length value before compression by the microcomputer.
[0123] Namely, if the 1st line of the upper part of drawing 7 is taken for an example, three **** "..." will be changed into (-*3). One subsequent "o" is changed into (o*1), and one subsequent "#" is changed into (#*1). One subsequent "o" is changed into (o*1), and subsequent 3 **** "..." are changed into (-*3). One subsequent "o" is changed into (o*1), subsequent 4 **** "####" are changed into (#*4), one subsequent "o" is changed into (o*1), and the last one "-" is changed into (-*1).
[0124] Consequently, as shown to CHUBU ENGINEERING CORPORATION of drawing 7 , the run length data before the compression of the 1st line become as shown in "-*3/o*1/#*1/o*1/and *3/o*1/#*4/o*1/and *1." This data is constituted by the combination of image information, such as an alphabetic character pixel color, and the number of continuation pixels which shows that number of continuation.
[0125] In the following, the pixel data stream of two lines - the 9th line of the drawing 7 upper part turns into the same a run length data stream before compression as shown in two lines - the 9th line of drawing 7 CHUBU ENGINEERING CORPORATION.
[0126] Here, if the data of the 1st line are observed, since three background pixel colors "-" continue from the start of Rhine, the compression regulation 1 of drawing 5 is applied. Consequently, it is encoded by having combined (00) showing "..." of the beginning of the 1st line, i.e., (-*3), 2 bits showing "3", (11), and a background pixel color "-" (1100).
[0127] Since "o" is one piece, as for the data of the 1st line as follows, a regulation 1 is applied too. It is encoded by having combined (10) showing consequently, 1st line the following [o (01), i.e., (o*1), 2 bits showing "1",", and an emphasis pixel color "o" (0110).

[0128] Furthermore, since "#" is one piece, as for the following data, a regulation 1 is applied too. It is encoded by having combined (01) showing consequently, 1st line following [# (01), i.e., (#*1), 2 bits showing "1",", and an alphabetic character pixel color "#" (0101). (In CHUBU ENGINEERING CORPORATION of drawing 7 , and the lower part, the broken line has enclosed and illustrated the part about this #.) Like the following, (o*1) is encoded by (0110), (-*3) is encoded by (1100) and (o*1) is encoded by (0110).
[0129] Since "#" is four pieces, as for the data of the after that of the 1st line, the compression regulation 2 of drawing 5 is applied. It is encoded by having combined (01) which expresses an alphabetic character pixel color "#" as consequently, 1st line this [# (00), i.e., (#*4), the 2-bit header which shows that the regulation 2 was applied,", and 4 bits (0100) showing the number of continuation pixels "4" (00010001). (The broken line has enclosed and illustrated the part about this #.) the 1st line -- further, since "o" is one piece, as for subsequent data, a regulation 1 is applied. It is encoded by having combined (10) showing consequently, this [o (01), i.e., (o*1), 2 bits showing "1",", and an emphasis pixel color "o" (0110).
[0130] Since "-" is one piece, as for the data of the 1st line last, a regulation 1 is applied. It is encoded by having combined (00) showing consequently, this [- (01), i.e., (-*1), 2 bits showing "1",", and a background pixel color "-" (0100).
[0131] Run length compression is carried out as mentioned above like the run length data before the compression of the 1st line "-*3/o*1/#*1/o*1/and *3/o*1/#*4/o*1/and *1" (0100 (0110 (00010001 (0110 (1100 (0110 (0101 (0110 (1100)))))))), and encoding of the 1st line is completed.
[0132] Encoding advances to the 8th line like the following. At the 9th line, all of one line are occupied in the same background pixel color "-." In this case, the compression regulation 5 of drawing 5 is applied. Consequently, the run length data before the compression of the 9th line "-*16" are encoded by (0000000000000000) which combined the 2-bit pixel data (00) to which a background pixel color "-" is indicated to be the 14-bit header (00000000000000) which shows that the same background pixel color "-" continues to the Rhine end. [16-bit]
[0133] In addition, encoding based on the above-mentioned regulation 5 is applied, also when beginning from the middle of the data for compression being Rhine and continuing to the Rhine end.
[0134] while drawing 10 explains the flow to the playback in the user side from mass production of a high density optical disk with the image information encoded based on this invention --; -- it is a block diagram explaining the flow from broadcast / cable distribution of the image information encoded based on this invention to the reception/playback in a user/subscriber.
[0135] For example, if the run length data before compression as shown to CHUBU ENGINEERING CORPORATION of drawing 7 are inputted into the encoder 200 of drawing 10 , run length compression (encoding) of the data into which the encoder 200 was inputted by software processing based on the compression regulations 1-6 of drawing 5 will be carried out.
[0136] When the data of logical organization as shown in optical disk OD as shown in drawing 1 at drawing 2 are recorded, run length compression processing (encoding processing) by the encoder 200 of drawing 10 is carried out to the subimage data of drawing 3 .
[0137] Various data which are need completing above-mentioned optical disk OD are also inputted into the encoder 200 of drawing 10 . These data are compressed based on the specification of MPEG (Mortion Picture Expert Group), and the digital data after compression is sent to the laser cutting machine 202, or the modulator/transmitter 210.
[0138] In the laser cutting machine 202, the MPEG compressed data from an encoder 200 is cut into the mother disk which is not illustrated, and the optical disk master 204 is manufactured.
[0139] In the two-sheet lamination high density optical disk mass-production facility 206, this master 204 is made into a form, for example, the information on a master is imprinted by the laser beam reflective film on a polycarbonate substrate with a thickness of 0.6mm. The polycarbonate substrate of two masses with which respectively different master information was imprinted is stretched, and serves as a double-sided optical disk (or one side reading form double-sided disk) with a thickness of 1.2mm.
[0140] Lamination high density optical disk OD mass-produced with facility 206 is distributed to various commercial scenes, and arrives to a user.
[0141] The distributed disk OD is played with a user's regenerative apparatus 300. This equipment 300 is equipped with the decoder 101 which restores the data encoded with the encoder 200 to the

information on original. The information decoded by the decoder 101 is sent and converted into a video signal by a user's monitor TV. In this way, an end user can admire the image information on original now from the disk OD by which extensive distribution was carried out.

[0142] On the other hand, the condensed information sent to the modulator / transmitter 210 is modulated and transmitted in accordance with predetermined specification from an encoder 200. For example, satellite broadcasting service (212) of the compression image information from an encoder 200 is carried out with corresponding speech information. Or cable transmission (212) of the compression image information from an encoder 200 is carried out with corresponding speech information.

[0143] The compression image / speech information by which broadcast or cable transmission was carried out are received by receiver / demodulator 400 of a user or a subscriber. This receiver / demodulator 400 are equipped with the decoder 101 which restores the data encoded with the encoder 200 to the information on original. The information decoded by the decoder 101 is sent and converted into a video signal by a user's monitor TV. In this way, an end user can admire the image information on original now from the compression image information by which broadcast or cable transmission was carried out.

[0144] Drawing 11 is the block diagram showing 1 operation gestalt (non-interlaced specification) of the decoder hardware which performs image decoding (run length elongation) based on this invention. The decoder 101 (refer to drawing 10) which decodes the subimage data SPD (32 about data of drawing 3) by which run length compression was carried out can be constituted like drawing 11.

[0145] Hereafter, the subimage data decoder which carries out run length elongation of the signal containing the pixel data with which run length compression of the format as shown in drawing 4 was carried out is explained, referring to drawing 11.

[0146] As shown in drawing 11, this subimage decoder 101 Data I/O102 and; into which the subimage data SPD are inputted The subimage data SPD Memory 108 to save; The continuation code length (coding header) of one unit (1 block) is detected from the run information on the code data (pixel data by which run length compression was carried out) read from the memory control section 105 which controls R/W actuation of this memory 108, and the; memory 108. It is what is outputted by this code data OFF Wakebe 103. the continuation code length detection section 106 which outputs the carving information of that continuation code length, and; -- code data OFF Wakebe 103 who takes out the code data for 1 block according to the information from this continuation code length detection section 106, and; -- The signal which exists and shows the run information on 1 compression unit, and the signal (period signal) which shows the number of "0" bit continuation how many it is outputted from the continuation code length detection section 106, and "0" of a data bit is continuing from the head of the code data for 1 block Reception, The pixel color information from the run length setting section 107 and; code data OFF Wakebe 103 which calculates the number of continuation pixels of 1 block from these signals, and the period signal outputted from the run length setting section 107 Reception, The header data (refer to drawing 4) in the subimage data SPD read from the pixel color output section 104 (Fast-in/Fast-out type) to which only the period outputs color information, and the; memory 108 are read. The color information over Rhine where the microcomputer 112 which performs various processing setup and control based on the read data, the address control section 109 which controls the R/W address of the; memory 108, and; run information do not exist with a microcomputer 112 It consists of the display effective authorization sections 110 which determine the display area when displaying a subimage on the insufficient pixel color setting section 111,;TV screen, etc. which are set up.

[0147] It is as follows when another way of speaking explains the above-mentioned explanation again. That is, as shown in drawing 11, the subimage data SPD by which run length compression was carried out are sent into the bus of the decoder 101 interior through data I/O102. The data SPD sent into the bus are sent to memory 108 through the memory control section 105, and are memorized there. Moreover, the internal bus of a decoder 101 is connected to code data OFF Wakebe 103, the continuation code length detection section 106, and a microcomputer (MPU or CPU) 112.

[0148] The sub-imaging unit header 31 of the subimage data read from memory 108 is read with a microcomputer 112. From the read header 31, based on the various parameters shown in drawing 4, a microcomputer 112 sets a decoding starting address (SPDDADR) as the address control section 109, sets the information (SPDSIZE) on the display starting position of a subimage, display width of face,

and display quantity as the display effective authorization section 110, and assigns the display width of face (the number of dots on Rhine) of a subimage to code data OFF Wakebe 103. The set-up various information is saved at the internal register of each part (109, 110, 103). The various information saved at the register can be accessed now with a microcomputer 112 after it.

[0149] The address control section 109 starts read-out of the subimage data which are going to access memory 108 and it is going to decode through the memory control section 105 based on the decoding starting address (SPDDADR) set as the register. In this way, the subimage data read from memory 108 are given to the code data slicing part 103 and the continuation code length detection section 106.

[0150] The coding header (the regulations 2-5 of drawing 5 2-14 bits) of the subimage data SPD by which run length compression was carried out is detected by the continuation code length detection section 106, and the number of continuation pixels of the same pixel data in Data SPD is detected by the run length setting section 107 based on the signal from the continuation code length detection section 106.

[0151] That is, the continuation code length detection section 106 counts the number of "0" bits of the data read from memory 108, and detects a coding header (refer to drawing 5). According to the value of the detected coding header, this detection section 106 is carved into code data OFF Wakebe 103, and gives information SEP.INFO.

[0152] Code data OFF Wakebe 103 sets pixel data (SEPARATED DATA; here pixel color) as the FIFO type pixel color output section 104 while setting the number of continuation pixels (run information) as the run length setting section 107 according to given carving information SEP.INFO. In that case, code data OFF Wakebe 103 counts the number of pixels of subimage data, and is comparing the number counted value of pixels with the display width of face (the number of pixels of one line) of a subimage.

[0153] When decoding for one line is completed and a cutting tool aryne is not carried out (that is, the data bit length for one line is not the multiple of 8), code data OFF Wakebe 103 considers that tail 4 bit data on the Rhine are dummy data to which it was added at the time of encoding, and omits them.

[0154] The run length setting section 107 gives the signal (PERIOD SIGNAL) for making pixel data output to the pixel color output section 104 based on said number of continuation pixels (run information) and pixel dot clock (DOTCLK), and a horizontal/Vertical Synchronizing signal (H-SYNC/V-SYNC). Then, the pixel color output section 104 outputs the pixel data from code data OFF Wakebe 103 as a decoded indicative data, while a pixel data out signal (PERIOD SIGNAL) is active (that is, during the period which outputs the same pixel color).

[0155] When decoding initiation Rhine is changed by the directions from a microcomputer 112 in that case, Rhine without run information may exist. In that case, the insufficient pixel color setting section 111 gives the data (COLOR INFO.) of the insufficient pixel color set up beforehand to the pixel color output section 104. Then, while the Rhine data without run information are given to code data OFF Wakebe 103, the pixel color output section 104 outputs the insufficient pixel color data (COLOR INFO.) from the insufficient pixel color setting section 111.

[0156] That is, if there is no image data into the inputted subimage data SPD in the case of the decoder 101 of drawing 11, a microcomputer 112 will set the pixel color information which carries out part lack as the insufficient pixel color setting section 111.

[0157] The display authorization (Display Enable) signal which determines whether to display on this pixel color output section 104 the subimage decoded by which location on the monitor display which is not illustrated is given from the display effective authorization section (Display Activator) 110 synchronizing with the horizontal/Vertical Synchronizing signal of a subimage image. Moreover, based on the color information directions from a microcomputer 112, a color change-over signal is sent to the output section 104 from the authorization section 110.

[0158] The address control section 109 sends out address data and various timing signals after a processing setup by the microcomputer 112 to the memory control section 105, the continuation code length detection section 106, code data OFF Wakebe 103, and the run length setting section 107.

[0159] In case the pack of the subimage data SPD is incorporated through the data I/O section 102 and it is stored in memory 108, the contents (a decoding starting address, a decoding ending address, a display starting position, display width of face, display height, etc.) of the pack header of this data SPD are read with a microcomputer 112. A microcomputer 112 sets a decoding starting address, a decoding ending address, a display starting position, display width of face, display height, etc. as the display effective

authorization section 110 based on the read contents. At this time, the compressed pixel data are what bit configuration, or (here, it is considering as 2 bits of pixel data) it can constitute so that it can determine from the contents of the sub-imaging unit header 31 of drawing 4.

[0160] Hereafter, the compressed pixel data explain actuation of the decoder 101 of drawing 11 about the case of 2 bit patterns (use regulations are the regulations 1-6 of drawing 5).

[0161] If a decoding start address is set up with a microcomputer 112, the address control section 109 will send a reading start signal to the continuation code length detection section 106 while sending the address data corresponding to the memory control section 105.

[0162] The continuation code length detection section 106 answers the sent reading start signal, sends a lead signal to the memory control section 105, and reads coded data (compressed subimage data 32). And in this detection section 106, it is confirmed for all 2 bits of high orders among the read data whether to be "0" or not.

[0163] When they are not "0", it is judged with the block length of a compression unit being 4 bits (regulation 1 reference of drawing 5).

[0164] If they (2 bits of high orders) are "0", 2 bits (4 bits of high orders) which continues further will be checked. When they are not "0", it is judged with the block length of a compression unit being 8 bits (regulation 2 reference of drawing 5).

[0165] If they (4 bits of high orders) are "0", 2 bits (6 bits of high orders) which continues further will be checked. When they are not "0", it is judged with the block length of a compression unit being 12 bits (regulation 3 reference of drawing 5).

[0166] If they (6 bits of high orders) are "0", 8 bits (14 bits of high orders) which continues further will be checked. When they are not "0", it is judged with the block length of a compression unit being 16 bits (regulation 4 reference of drawing 5).

[0167] If they (14 bits of high orders) are "0", while the block length of a compression unit is 16 bits, it is judged with the pixel data same to the Rhine end continuing (regulation 5 reference of drawing 5).

[0168] Moreover, if it is not the integral multiple of 8, in order to suppose that it remains as it is if the number of bits of the pixel data read to the Rhine end is the integral multiple of 8, and to realize a cutting tool aryne, it is judged with 4-bit dummy data being required by the tail of the read data (regulation 6 reference of drawing 5).

[0169] Code data OFF Wakebe 103 takes out 1 block (1 compression unit) of the subimage data 32 from memory 108 based on the above-mentioned judgment result by the continuation code length detection section 106. And in OFF Wakebe 103, data can carve into the number of continuation pixels, and pixel data (color information on a pixel etc.) by one taken-out block. The data (RUN INFO.) of the number of continuation pixels which was able to be carved are sent to the run length setting section 107, and the pixel data (SEPARATED DATA) which were able to be carved are sent to the pixel color output section 104.

[0170] On the other hand, the display effective authorization section 110 generates the display enabling signal (enable signal) which specifies a subgraphic display period synchronizing with the pixel dot clock (PIXEL-DOT CLK), Horizontal Synchronizing signal (H-SYNC), and Vertical Synchronizing signal (V-SYNC) which are supplied from the equipment outside according to the display starting position information, display width-of-face information, and display quantity information which were received from the microcomputer 112. This display enabling signal is outputted to the run length setting section 107.

[0171] The signal which shows whether it is outputted from the continuation code length detection section 106, and current block data continues to the Rhine end, and the continuation pixel data (RUN INFO.) from code data OFF Wakebe 103 are sent to the run length setting section 107. The run length setting section 107 determines the number of pixel dots which the block under decoding takes charge of based on the signal from the detection section 106, and the data from OFF Wakebe 103, and during the period corresponding to this number of dots, it is constituted so that a display enabling signal (output enable signal) may be outputted to the pixel color output section 104.

[0172] The pixel color output section 104 is enabling during the period signal reception from the run length setting section 107, and sends out the pixel color information received from code data OFF Wakebe 103 to the display which is not illustrated during the period as an indicative data decoded synchronizing with the pixel dot clock (PIXEL-DOT CLK). That is, the same indicative data for several

pixel pattern continuation dot minutes of a block is outputted from the pixel color output section 104 during decoding.

[0173] Moreover, if coded data judges with it being the pixel color data same to the Rhine end, the continuation code length detection section 106 will output the signal for continuation code length 16 bits to code data OFF Wakebe 103, and will output the signal which shows that it is the pixel color data same to the Rhine end to the run length setting section 107.

[0174] If the above-mentioned signal is received from the detection section 106, the run length setting section 107 will output an output enable signal (period signal) to the pixel color output section 104 so that the color information on coded data may continue holding enabling state, until Horizontal Synchronizing signal H-SYNC becomes inactive.

[0175] In addition, in order for a microcomputer 112 to scroll the contents of a display of a subimage, when decoding initiation Rhine is changed, there is possibility (that is, decoding lines run short) that the data line considered as decoding use does not exist in the viewing area set up beforehand.

[0176] The decoder 101 of drawing 11 has prepared beforehand the pixel color data which fill Rhine which ran short, in order to cope with it in such a case. And if the lack of Rhine is actually detected, it will be switched to the display mode of insufficient pixel color data. If giving data and a signal to the display effective authorization section 110 from the address control section 109, speaking concretely, the authorization section 110 will send a color change-over signal (COLOR SW SIGNAL) to the pixel color output section 104. The pixel color output section 104 answers this change-over signal, and switches the decoding output of the pixel color data from code data to the decoding output of the color information (COLOR INFO.) from the insufficient pixel color setting section 110. This change-over condition is maintained during the display period (DISPLAY ENABLE = active) of insufficient Rhine.

[0177] In addition, decoding actuation can also be stopped in the meantime instead of using insufficient pixel color data, when the above-mentioned lack of Rhine arises.

[0178] What is necessary is just to specifically output the color change-over signal which specifies a display termination from the authorization section 110 to the pixel color output section 104, when data and a signal are inputted into the display effective authorization section 110 from the address control section 109. Then, the pixel color output section 104 comes to stop the display of a subimage during the period when this display termination assignment color change-over signal is active.

[0179] Drawing 8 gives two-example (non-interlaced display and interlace display) explanation of how a character pattern "A" is decoded among the pixel data (subimage data) encoded in the example of drawing 7.

[0180] The decoder 101 of drawing 11 can be used when decoding to a non-interlaced indicative data as shows compressed data as shown in the upper part of drawing 8 to the left lower quadrant of drawing 8.

[0181] On the other hand, when decoding to an interlace indicative data as shows compressed data as shown in the upper part of drawing 8 to the lower right section of drawing 8, the Rhine doubler (for example, change-over of;V-SYNC unit which re-scans Rhine #10 of the same contents as Rhine #1 of the odd number field in the even number field) which scans the same pixel Rhine twice is needed.

[0182] Moreover, when indicating the amount of image display equivalent to an interlace display by non-interlaced one, another in doubler (for example, change-over of;H-SYNC unit which makes Rhine #10 with the same contents as Rhine #1 of the drawing 8 lower right section follow Rhine #1) is needed.

[0183] Drawing 12 is a block diagram explaining the operation gestalt (interlace specification) with the function of the above-mentioned Rhine doubler of decoder hardware. The decoder 101 of drawing 10 can also consist of decoders of the configuration of drawing 12.

[0184] In the configuration of drawing 12, the microcomputer 112 is detecting the generating timing of the odd number field of an interlace display, and the even number field based on level/Vertical Synchronizing signal of a subimage.

[0185] If the odd number field is detected, a microcomputer 112 will give the mode signal which shows what "is been the current odd number field" to the selection-signal generation section 118. Then, the signal as which the decoding data from a decoder 101 are made to choose it is outputted to a selector 115 from the selection-signal generation section 118. Then, the pixel data of Rhine #1-#9 of the odd number field (refer to the lower right section of drawing 8) are sent out as a video outlet through a selector 115 outside from a decoder 101. At this time, the pixel data of Rhine #1-#9 of these odd number

field are once stored in the Rhine memory 114.

[0186] If it detects having moved to the even number field, a microcomputer 112 will give the mode signal which shows what "is been the current even number field" to the selection-signal generation section 118. Then, the signal as which it is stored in the Rhine memory 114 from the selection-signal generation section 118 to a selector 115, and ** is made to choose it is outputted. Then, the pixel data of Rhine #10-#18 of the even number field (refer to the lower right section of drawing 8) are sent out as a video outlet through a selector 115 outside from the Rhine memory 114.

[0187] In this way, the subimage image of Rhine #1-#9 of the odd number field (the example of drawing 8 alphabetic character "A") and the subimage image of Rhine #10-#18 of the even number field (alphabetic character of drawing 8 "A") are compounded, and an interlace display is realized.

[0188] By the way, the parameter bit (SPMOD) which shows the frame display mode / field display mode of TV screen is prepared in the sub-imaging unit header 31 of the subimage data shown in drawing 4.

[0189] It is as follows when indicating the amount of image display equivalent to an interlace display by non-interlaced one.

[0190] The microcomputer 112 of drawing 12 can judge whether it is the interlace mode (active "1") or it is in non-interlaced mode from the set point (active = "1"; inactive = "0") of the above-mentioned parameter SPMOD, when the sub-imaging unit header 31 is read (inactive "0").

[0191] In the configuration of drawing 12, it detects that a microcomputer 112 is the interlace mode as Parameter SPMOD is active = "1", and the mode signal which shows the interlace mode is sent to the selection-signal generation section 118. The generation section 118 which received this mode signal gives a change-over signal to a selector 115 for every generating of Horizontal Synchronizing signal H-SYNC. Then, a selector 115 switches by turns the decoding output (DECODED DATA) of the present field from the subimage decoder 101, and the decoding output of the present field stored temporarily in the Rhine memory 114 for every generating of Horizontal Synchronizing signal H-SYNC, and sends out a video outlet to Exterior TV etc.

[0192] If the present decoding data and the decoding data in the Rhine memory 114 switch for every H-SYNC as mentioned above and it is outputted, on TV screen, an image with the image (decoded data) (a horizontal scanning line is twice) twice the consistency of original will be displayed by the interlace mode.

[0193] In such a subimage decoder 101 of a configuration, after data are read by one line, decoding is not carried out, but the bit data by which a sequential input is carried out counting 1 bit at a time from the start of a decoding data unit block, 2-16 bits is read and decoding of them is carried out. In this case, the bit length (4 bits, 8 bits, 12 bits, 16 etc. bits, etc.) of decoding data 1 unit is detected just before decoding. and it is restored to three kinds of pixels (the example of drawing 7 -- "-", "o", and "#") on real time (playback), and the compressed pixel data go by the detected data length unit.

[0194] For example, in decoding the pixel data encoded according to the regulation 1 of drawing 5 - the regulation 6, the subimage decoder 101 should just be comparatively equipped with the data buffers (Rhine memory 114 etc.) of small capacity with the bit counter. If it puts in another way, the circuitry of the subimage decoder 101 can be made comparatively simple, and the whole equipment containing this encoder can be miniaturized.

[0195] This invention encoder does not need a large-scale code table in a decoder like the conventional MH coding approach, and data are read twice and it becomes unnecessary that is, to carry out them like the algebraic-sign-ized approach at the time of encoding. Furthermore, the decoder of this invention does not need the comparatively complicated hardware which is ** of a multiplier, but can embody it by the addition of easy circuits, such as a counter and a small capacity buffer.

[0196] According to this invention, run length compression / encoding of the pixel data (2 bit patterns a maximum of four kinds) of varieties, and its run length elongation / decoding can be realized now with a comparatively easy configuration.

[0197] Drawing 13 is a flow chart explaining the software which performs image encoding (run length compression) concerning the gestalt of 1 implementation of this invention, and is performed by the encoder (200) of drawing 10.

[0198] A series of encoding processings based on the run length compression regulations 1-6 of drawing 5 are performed as software processing with the microcomputer of the encoder 200 interior shown in

drawing 10. Processing of the whole encoding by the encoder 200 can be performed according to the flow of drawing 13, and run length compression of the pixel data in subimage data can be performed according to the flow of drawing 14.

[0199] In this case, first, if the number of Rhine and the number of dots of image data are specified by key input etc. (step ST 801), the computer of the encoder 200 interior will prepare the header field of subimage data, and will initialize the number of the line counts to "0" (step ST 802).

[0200] And if the sequential input of every 1 pixel of the pixel patterns is carried out, while the computer of the encoder 200 interior will acquire the first pixel data for 1 pixel (here 2 bits), saving the pixel data and setting a pixel count as "1", the dot number of counts is set as "1" (step ST 803).

[0201] Then, the internal computer of an encoder 200 acquires the pixel data (2 bits) of the following pixel pattern, and compares them with the pixel data under preservation inputted before one (step ST 804).

[0202] (No [of a step ST 805]), as a result of this comparison, when pixel data are not equal, encoding transform processing 1 is performed (step ST 806), and current pixel data are saved (step ST 807). And +1 increment of the pixel number of counts is carried out, and +1 increment also of the dot number of counts is carried out corresponding to this (step ST 808).

[0203] (Step ST805 Yes), in addition, as a result of a comparison at a step ST 804, when pixel data are equal, the encoding transform processing 1 of a step ST 806 is skipped, and it moves from it to a step ST 808.

[0204] The internal computer of an encoder 200 confirms whether pixel Rhine under current encoding is termination after the increment (step ST 808) of the pixel number of counts and the dot number of counts (step ST 809). If it is the Rhine end (step ST809 yes), encoding transform processing 2 will be performed (step ST 810). If it is not the Rhine end (no [step ST809]), processing of return, a step ST 804 - a step ST 808 will be repeated by the step ST 804.

[0205] If the encoding transform processing 2 of a step ST 810 ends, the computer of the encoder 200 interior will confirm whether be the integral multiple (condition by which the cutting tool aryne was carried out) whose bit string after encoding is 8 bits (step ST811A). If a cutting tool aryne is not carried out (no [step ST811A]), 4-bit dummy data (0000) is added to the tail of the bit string after encoding (step ST811B). If the cutting tool aryne of the bit string after this dummy addition processing or encoding is carried out (step ST811A yes), +1 increment of the line counters (general-purpose register inside a microcomputer etc.) of the computer in an encoder will be carried out (step ST 812).

[0206] After the increment of a line counter, if it has not arrived at last Rhine (no [step ST813]), processing of return, a step ST 803 - a step ST 812 is repeated by the step ST 803.

[0207] After the increment of a line counter, if it has arrived at last Rhine (step ST813 yes), encoding processing (here run length compression of the bit string of 2-bit pixel data) will be completed.

[0208] Drawing 14 is a flow chart explaining an example of the contents of the encoding transform processing 1 of drawing 13.

[0209] In the encoding transform processing 1 (step ST 806) of drawing 13, since it assumes that the pixel data for encoding are 2-bit width of face, the run length compression regulations 1-6 of drawing 5 are applied.

[0210] Corresponding to these regulations 1-6 [whether the pixel number of counts is 0 (step ST 901) and] [whether the pixel numbers of counts are 1-3 (step ST 902) or the pixel numbers of counts are 4-15 (step ST 903), and] [whether the pixel numbers of counts are 16-63 (step ST 904) or the pixel numbers of counts are 64-255 (step ST 905), and] A judgment of an or [the pixel number of counts is / whether pixel counted value shows the Rhine end (step ST 906) or / 256 or more (step ST 907)] is made by computer software.

[0211] Based on the above-mentioned decision result, the internal computer of an encoder 200 determines the number of bits (one unit length of the pixel data of the same class) of the run field (a step ST 908 - a step ST 913), and secures the field for several of these run field bit minutes after the sub-imaging unit header 31. In this way, the number of continuation pixels is outputted to the secured run field, pixel data are outputted to the pixel field, and it is recorded on the storage (not shown) of the encoder 200 interior (step ST 914).

[0212] Drawing 15 is a flow chart explaining the software which performs image decoding (run length elongation) concerning the gestalt of 1 implementation of this invention, and is performed with drawing

11 or the drawing 12 microcomputer 112.
[0213] Moreover, drawing 16 is a flow chart explaining an example of the contents of the decoding step (ST1005) used by the software of drawing 15.
[0214] That is, a microcomputer 112 reads the first header 31 part of the subimage data (pixel data are 2 bit patterns) by which run length compression was carried out, and analyzes the contents (refer to drawing 4). And based on the contents of the analyzed header, although decoded, the number of Rhine and the number of dots of data are specified so. If the number of these Rhine and the number of dots are specified (step ST 1001), the number of the line counts and the dot number of counts will be initialized by "0" (a step ST 1002 - a step ST 1003).
[0215] A microcomputer 112 incorporates the data bit train which continues after the sub-imaging unit header 31 one by one, and carries out counting of the number of dots, and the dot number of counts. And the number of continuation pixels is computed by subtracting the dot number of counts from the number of dots (step ST 1004).
[0216] In this way, if the number of continuation pixels is computed, a microcomputer 112 will perform decoding according to the value of this number of continuation pixels (step ST 1005).
[0217] After decoding of a step ST 1005, a microcomputer 112 adds the dot number of counts and the number of continuation pixels, and makes this the new dot number of counts (step ST 1006).
[0218] And every time it takes in data one by one, decoding of a step ST 1005 is performed, and a microcomputer 112 ends decoding about the data for one line, when in agreement with the number of the Rhine termination (location of the Rhine end) which the accumulated dot number of counts set up first (step ST1007 yes).
[0219] Next, if the cutting tool aryne of the decoded data is carried out (step ST1008A yes), a part for dummy data will be removed (step ST1008B). And processing of a step ST 1002 - a step ST 1009 is repeated until it increments the number of the line counts +one time (step ST 1009) and arrives at last Rhine (no [step ST1010]). Decoding will be ended if it arrives at last Rhine (step ST1010 yes).
[0220] The contents of processing of the decoding step ST 1005 of drawing 15 are shown in drawing 16.

[0221] In this processing, if 2 bits is acquired from the start, that bit repeats the textile which judges whether it is "0" (a step ST 1101 - a step ST 1109). Thereby, it is determined (a step ST 1110 - a step ST 1113)., the number of continuation pixels corresponding to the run length compression regulations 1-6, i.e., number of run continuation, of drawing 5
[0222] And after the number of run continuation is determined, let 2 bits read after after it be a pixel pattern (pixel data; color information which is a pixel) (step ST 1114).
[0223] If pixel data (color information on a pixel) are decided and a 2-bit pixel pattern will be outputted until it sets an index parameter "i" to 0 (step ST 1115) and a parameter "i" is in agreement with the number of run continuation (step ST 1116) (step ST 1117), a parameter "i" is incremented +one time (step ST 1118), the output for one unit of the same pixel data is finished, and decoding is ended.
[0224] thus -- according to the decoding approach of this subimage data -- decoding of subimage data -- several bits judgment processing, carving processing of a data block, and counting of a data bit -- processing -- ** -- it ends with the easy processing to say. For this reason, the processing and the configuration which decodes the bit data which became unnecessary as for the large-scale code table used by the conventional MH coding approach etc., and were encoded to the pixel information on original become easy.
[0225] In addition, although the sign bit length for one unit of the same pixel shall be determined with the gestalt of the above-mentioned implementation if 16 bits [a maximum of] bit data are read at the time of data decoding, this sign bit length is not limited to this. For example, 32 bits or 64 bits are sufficient as this sign bit length. However, if bit length increases, a data buffer with the big part capacity is needed.
[0226] moreover -- although pixel data (color information on a pixel) were made into the color information on three colors chosen from the color palette of for example, 16 colors with the gestalt of the above-mentioned implementation -- except [this] -- the three primary colors (the red component R, the green component G, blue component B; or the luminance-signal component Y, the chroma red signal component Cr, chroma green light component Cb, etc.) of a color -- 2-bit pixel data can also express each amplitude information. That is, pixel data are not limited to the color information on a specific

class.
[0227] Drawing 17 shows the modification of drawing 11. Although actuation in which a microcomputer 112 starts a coding header is performed by software in drawing 11, logging actuation of a coding header is performed in hardware inside the decoder 101 in drawing 17.
[0228] That is, as shown in drawing 17, the subimage data SPD by which run length compression was carried out are sent into the bus of the decoder 101 interior through data I/O102. The data SPD sent into the bus are sent to memory 108 through the memory control section 105, and are memorized there. Moreover, the internal bus of a decoder 101 is connected to code data OFF Wakebe 103, the continuation code length detection section 106, and the header slicing part 113 connected with the microcomputer (MPU or CPU) 112.
[0229] The sub-imaging unit header 31 of the subimage data read from memory 108 is read by the header slicing part 113. From the read header 31, based on the various parameters shown in drawing 4, a slicing part 113 sets a decoding starting address (SPDDADR) as the address control section 109, sets the information (SPDSIZE) on the display starting position of a subimage, display width of face, and display quantity as the display effective authorization section 110, and assigns the display width of face (the number of dots on Rhine) of a subimage to code data OFF Wakebe 103. The set-up various information is saved at the internal register of each part (109, 110, 103). The various information saved at the register can be accessed now with a microcomputer 112 after it.
[0230] The address control section 109 starts read-out of the subimage data which are going to access memory 108 and it is going to decode through the memory control section 105 based on the decoding starting address (SPDDADR) set as the register. In this way, the subimage data read from memory 108 are given to the code data slicing part 103 and the continuation code length detection section 106.
[0231] The coding header (the regulations 2-5 of drawing 5 2-14 bits) of the subimage data SPD by which run length compression was carried out is detected by the continuation code length detection section 106, and the number of continuation pixels of the same pixel data in Data SPD is detected by the run length setting section 107 based on the signal from the continuation code length detection section 106.
[0232] Hereafter, the decoding approach other than the decoding approach explained using drawing 15 and drawing 16 is explained, referring to drawing 17 - drawing 21.
[0233] Drawing 18 is a flow chart explaining the first half of the image decoding (run length elongation) processing concerning the gestalt of other implementation of this invention.
[0234] As for each block inside [decoder 101] drawing 17, it is initialized when starting decoding (the clearance of a register, reset of a counter, etc.). Then, the sub-imaging unit header 31 is read and the contents (various parameters of drawing 4) are set to header OFF Wakebe's 113 internal register (step ST 1200).
[0235] If the various parameters of a header 31 are set to header OFF Wakebe's 113 register, the status which reading of a header 31 ended will be notified to a microcomputer 112 (step ST 1201).
[0236] If a header reading exit status is received, a microcomputer 112 will specify decoding initiation Rhine (for example, SPLine1 of drawing 4), and will notify header OFF Wakebe 113 of the initiation Rhine (step ST 1202).
[0237] If header OFF Wakebe 113 receives the notice of specified decoding initiation Rhine It is based on the various parameters of the header 31 set to its own register. The address (SPDDADR of drawing 4) and the decoding ending address (SPEDADR of drawing 4; address relatively shifted from the initiation Rhine address by one line) of specified decoding initiation Rhine are set to the address control section 109. The display starting position of a subimage and display width of face which were decoded, display quantity, and (SPDSIZE of drawing 4) are set to the display effective authorization section 110. The value (LNEPIX; the number of pixels for one line contained in SPDSIZE although not illustrated in drawing 4) of display width of face is set to code data OFF Wakebe 103 (step ST 1203).
[0238] The address control section 109 sends the decoding address to the memory control section 105. Then, the data (compressed subimage data SPD) which it is going to decode are read from memory 108 to coded data OFF Wakebe 103 and the continuation code length detection section 106 through the memory control section 105. the data read at that time -- a cutting tool unit -- it is -- OFF Wakebe 103 and the detection section 106 -- it is set to each internal register (step ST 1204).
[0239] The continuation code length detection section 106 counts the number of "0" bits of the data read

from memory 108, and detects the coding header applicable to either of the regulations 1-5 of drawing 5 from the counted value (step ST 1205). The detail of this coding header ** is later mentioned with reference to drawing 20.

[0240] The continuation code length detection section 106 generates OFF part information SEP.INFO. corresponding to one regulation of the regulations 1-5 of drawing 5 according to the value of the detected coding header (step ST 1206).

[0241] For example, OFF part information SEP.INFO. which shows a regulation 1 if the counted value of "0" bits of the data read from memory 108 is zero is generated. OFF part information SEP.INFO. which shows a regulation 2 if this counted value is 2 is generated. If this counted value is 4, OFF part information SEP.INFO. which shows a regulation 3 is generated, if this counted value is 6, OFF part information SEP.INFO. which shows a regulation 4 is generated, and if this counted value is 14, OFF part information SEP.INFO. which shows a regulation 5 is generated. In this way, generated OFF part information SEP.INFO. is transmitted to coded data OFF Wakebe 103.

[0242] Coded data OFF Wakebe 103 sets to the pixel color output section 104 the 2-bit pixel data (pixel color data; data which were able to be carved from the subimage data packet) which continue after the number data of continuation pixels while setting the number of continuation pixels (PIXCNT; run information) to the run length setting section 107 according to the contents of OFF part information SEP.INFO. from the continuation code length detection section 106. At this time, the increment of the present counted value NOWPIX of a pixel counter (not shown) is carried out only for the part of the number PIXCNT of continuation pixels inside OFF Wakebe 103 (step ST 1207).

[0243] Drawing 19 is a flow chart explaining the second half (the node A of drawing 18 or subsequent ones) of the image decoding (run length elongation) processing concerning the gestalt of other implementation of this invention.

[0244] In the precedence step ST 1203, coded data OFF Wakebe 103 is notified of the number LNEPIX of pixel data for one line corresponding to the display width of face of a subimage (the number of dots) from header OFF Wakebe 113. In coded data OFF Wakebe 103, it is confirmed [it was notified that the value NOWPIX of the internal pixel counter was] whether be over the number LNEPIX of pixel data by one line (step ST 1208).

[0245] (Step ST1208 No), in this step, when the pixel counter value NOWPIX has become by one line more than the number LNEPIX of pixel data, OFF Wakebe's 103 internal register with which the data for 1 byte were set is cleared, and the pixel counter value NOWPIX becomes zero (step ST 1209). When the cutting tool aryne is carried out at this time, 4-bit data will be omitted. By one line, the pixel counter value NOWPIX is not cleared when smaller than the number LNEPIX of pixel data, but as for (Step ST1208 Yes) and OFF Wakebe's 103 internal register, it becomes remaining as it is.

[0246] The run length setting section 107 generates a display period signal (PERIOD SIGNAL) with being required for carrying out a period output for the pixel data set to the pixel color output section 104 from the horizontal, Vertical Synchronizing signal H-SYNC, and V-SYNC which synchronize with the display screen of the main image the dot clock DOTCLK which determines the number PIXCNT of continuation pixels (run information) and the transfer rate of a pixel dot which were set at the precedence step ST 1207, and a subimage. The generated display period signal is given to the pixel color output section 104 (step ST 1210).

[0247] The pixel color output section 104 outputs the OFF part data (for example, pixel data in which a pixel color is shown) set in the precedence step ST 1207 as an indicative data of the decoded subimage, while the display period signal is given from the run length setting section 107 (step ST 1211).

[0248] In this way, the outputted subgraphic display data will be behind compounded by the image of the main image suitably in the circuit part which is not illustrated, and will be displayed in TV monitor which is not illustrated.

[0249] After pixel data output processing of a step ST 1211, if decoding data are not completed, it returns to the step ST 1204 of drawing 18 (no [step ST1212]).

[0250] It can be judged by whether the data to the ending address (SPEDADR) of the subgraphic display data set by header OFF Wakebe 113 finish being processed in coded data OFF Wakebe 103 whether decoding data are completed.

[0251] If decoding of data is completed (step ST1212 yes), it will be confirmed whether the display enabling signal (DISPLAY ENABLE) from the display effective authorization section 110 is active. The

display effective authorization section 110 has generated the display enabling signal of an active state (for example, high-level) until an end-of-data signal (DATA END SIGNAL) is sent from the address control section 109.

[0252] If the display enabling signal is active, in spite of having completed data decoding, it will be judged with it being still during a display period (step ST1213 yes). In this case, the display effective authorization section 110 sends a color change-over signal to the run length setting section 107 and the pixel color output section 104 (step ST 1214).

[0253] At this time, the pixel color output section 104 has received insufficient pixel color data from the insufficient pixel color setting section 111. The pixel color output section 104 which received the color change-over signal from the display effective authorization section 110 switches the pixel color data to output to insufficient pixel color data from the insufficient pixel color setting section 111 (step ST 1215). Then, while a display enabling signal is active (loop formation of a step ST 1213 - a step ST 1215), during the display period of the subimage in which decoding data do not exist, it is the insufficient pixel color which the insufficient pixel color setting section 111 offers, and the display area of a subimage is filled.

[0254] If the display enabling signal is inactive, it will be judged with the display period of the decoded subimage having expired (no [step ST1213]). Then, the end status which shows that subimage decoding for one frame ended the display effective authorization section 110 is transmitted to a microcomputer 112 (step ST 1216). In this way, subimage decoding for one screen (one frame) is completed.

[0255] Drawing 20 is a flow chart explaining an example of the contents of the coding header appearance step (ST1205) of drawing 18. This coding header appearance processing is performed by the continuation code length detection section 106 of drawing 17 (or drawing 11).

[0256] First, the continuation code length detection section 106 is initialized, and the status counter (STSCNT) of the interior is set to zero (step ST 1301). Then, the contents for the consecutiveness of 2 bits of the data read into the detection section 106 from memory 108 in the cutting tool unit are checked. If these 2-bit contents are "00" (step ST1302 yes), one increment of the counter STSCNT will be carried out (step ST 1303). If checked 2 bits have not reached 1 byte of end read into the detection section 106 (no [step ST1304]), the contents for consecutiveness of 2 bits are checked further. If these 2-bit contents are "00" (step ST1302 yes), one more increment of the counter STSCNT will be carried out (step ST 1303).

[0257] (Step ST1304 Yes), as a result of repeating the loop formation of a step ST 1302 - a step ST 1304, when the consecutiveness of 2 bits checked at a step ST 1302 has reached 1 byte read into the detection section 106 of end, the coding header of drawing 5 will be size from 6 bits. In this case, the following data byte is read into the detection section 106 from memory 108 (step ST 1305), and the status counter STSCNT is set to "4" (step ST 1307). 1 byte of the same data are read into coincidence by coded data OFF Wakebe 103 at this time.

[0258] If the contents for 2 bits checked in the precedence step ST 1302 are not "00" after the status counter STSCNT is set to "4" or (no [step ST1302]), the contents of the status counter STSCNT will be decided and the contents will be outputted as contents of the coding header of drawing 5 (step ST 1307).

[0259] Namely, the coding header which shows the regulation 1 of drawing 5 if it is status counter STSCNT="0" is detected. The coding header which shows the regulation 2 of drawing 5 if it is status counter STSCNT="1" is detected. The coding header which shows the regulation 3 of drawing 5 if it is status counter STSCNT="2" is detected. If it is status counter STSCNT="3", the coding header which shows the regulation 4 of drawing 5 will be detected, and if it is status counter STSCNT="4", the coding header which shows the regulation 5 of drawing 5 (when the same pixel data continue to the end of Rhine) will be detected.

[0260] Drawing 21 is a flow chart explaining what image decoding of this invention is made, when the decoded image is scrolled.

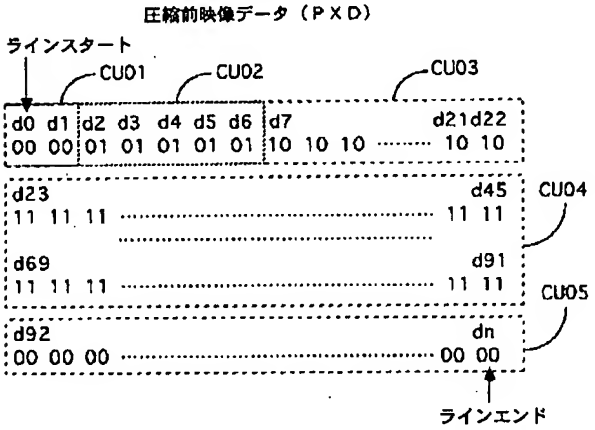
[0261] First, each block drawing 11 or inside [decoder 101] drawing 17 is initialized, and the zero clear of the line counter LINCNT which is not illustrated is carried out (step ST 1401). Next, a microcomputer 112 (drawing 11) or header OFF Wakebe 113 (drawing 17) receives the header reading exit status sent out at the step ST 1201 of drawing 18 (step ST 1402).

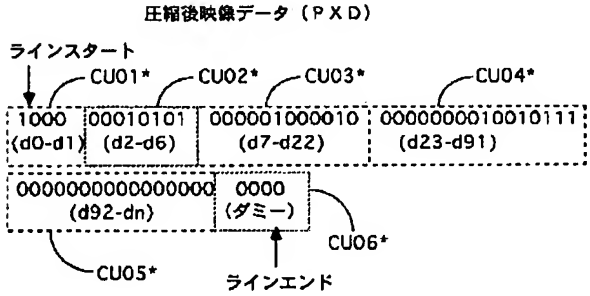
[0262] The contents (it is zero in the beginning) of the line counter LINCNT are transmitted to a microcomputer 112 (drawing 11) or header OFF Wakebe 113 (drawing 17) (step ST 1403). A microcomputer 112 or header OFF Wakebe 113 confirms whether the received status is an exit status (step ST 1206) of one frame (one screen) (step ST 1404).
[0263] If the received status is not an exit status of one frame (no [step ST1405]), it will stand by until this exit status comes. If the received status is an exit status of one frame (step ST1405 yes), one increment of the line counter LINCNT will be carried out (step ST 1406).
[0264] If the contents of the line counter LINCNT by which the increment was carried out have not reached in the end of Rhine (no [step ST1407]), decoding of drawing 15 - drawing 16 or decoding of drawing 18 - drawing 19 is resumed (step ST 1408), and it returns to a step ST 1403. By repeating the repetitive loop formation (a step ST 1403 - a step ST 1408) of this decoding, while the subimage by which run length compression was carried out is decoded, it comes to be scrolled.
[0265] (Step ST1407 Yes), on the other hand, when the contents of the line counter LINCNT by which the increment was carried out have reached the end of Rhine, decoding of the subimage data accompanied by scrolling is ended.
[0266] Drawing 22 is a block diagram explaining the outline of an optical disk record regenerative apparatus in which encoding and decoding based on this invention are performed.
[0267] In drawing 22, the optical disk player 300 has the same configuration as the conventional optical disk regenerative apparatus (a compact disc player or laser disk player) fundamentally. However, this optical disk player 300 can output now the digital signal (digital signal [being encoded]) before decoding the image information by which run length compression was carried out from inserted optical disk OD (what the image information containing the subimage data by which run length compression was carried out based on this invention was recorded on). Since the digital signal [this being encoded] is compressed, there may be little required transmission band width of face compared with the case where incompressible data are transmitted.
[0268] The compression digital signal from the optical disk player 300 is broadcast through a modulator / transmitter 210, or is sent out to a telecommunication cable.
[0269] The broadcast compression digital signal or the compression digital signal by which cable transmission was carried out is received by receiver / demodulator 400 of an addressee or a cable subscriber. This receiver 400 is equipped with the decoder 101 of a configuration as shown in drawing 11 or drawing 17. The decoder 101 of a receiver 400 outputs the image information which decodes the compression digital signal to which it received and restored, and contains **** image data before being encoded.
[0270] In the configuration of drawing 22, if the transmission system of transmission and reception has an average bit rate beyond 5M bit per second about, broadcast of high-definition multimedia image and speech information can be performed.
[0271] Drawing 23 is a block diagram with which the image information encoded based on this invention explains the case where it is sent and received among 2 computer users of arbitration, through communication networks (Internet etc.).
[0272] User #1 with self-information #1 managed with the host computer which is not illustrated owns the personal computer 5001, and various various input/output equipment 5011 and external storage 5021 are connected to this personal computer 5001. Moreover, the encoder and decoder based on this invention are incorporated at the internal slot (not shown) of this personal computer 5001, and it is equipped with the modem card 5031 with a function required for a communication link.
[0273] Similarly user #N with another self-information #N owns personal computer 500N, and 501Ns of various input/output equipment and 502 Ns of various external storage are connected to this personal computer 500N. Moreover, the encoder and decoder based on this invention are incorporated at a this personal computer 500N internal slot (not shown), and it is equipped with modem card 503N with a function required for a communication link.
[0274] Now, certain user #1 operates a computer 5001 and the case where computer 500N and a communication link of another user #N are performed through the circuits 600, such as the Internet, is assumed. In this case, since both sides have the modem cards 5031 and 503N with which the encoder and the decoder were incorporated, user #1 and user #N can exchange them for the image data efficiently compressed by this invention in a short time.

[0275] Drawing 24 shows the outline of the record regenerative apparatus which records the image information encoded based on this invention on optical disk OD, and decodes the recorded information based on this invention.
[0276] The encoder 200 of drawing 24 is constituted so that the same encoding processing (processing corresponding to drawing 13 - drawing 14) as the encoder 200 of drawing 10 may be performed by software or hardware (a firmware or a wired logical circuit is included).
[0277] In (2 7) a modulator / laser driver 702, the RLL modulation of the record signal containing the subimage data encoded with the encoder 200 and others is carried out. The modulated record signal is sent to the high power laser diode of the optical head 704 from a laser driver 702. By the laser for record from this optical head 704, the pattern corresponding to a record signal is written in a magneto-optic-recording disk or phase-change optical disk OD.
[0278] It is read by laser pickup of the optical head 706, and gets over in a demodulator / error correction section 708, and the information written in Disk OD receives error correction processing if needed. In voice / data-processing section 710 for images, as for the signal by which the error correction was restored to which and carried out, the information before record is reproduced in response to various data processing.
[0279] This data-processing section 710 contains the decoding section corresponding to the decoder 101 of drawing 11. Decoding (elongation of the compressed subimage data) corresponding to drawing 15 - drawing 16 is performed by this decoding section.
[0280] Drawing 25 has illustrated the condition that the encoder based on this invention was IC-ized with that circumference circuit.
[0281] Drawing 26 has illustrated the condition that the decoder based on this invention was IC-ized with that circumference circuit.
[0282] Drawing 27 has illustrated the condition that the encoder and decoder based on this invention were IC-ized with that circumference circuit.
[0283] That is, the encoder or decoder based on this invention can carry out [IC]-izing with a required circumference circuit, and this IC can be included in various devices and can carry out this invention now.
[0284] In addition, the data line on which the bit string of the data (PXD) after compression which was illustrated to drawing 9 rides is constituted so that the image information of one duty of the horizontal scanning line of TV display screen may usually be included. However, this data line can also be constituted so that the image information of all (that is, one frame) the horizontal scanning lines for one screen of constituting so that the image information for two or more of the horizontal scanning line of TV screen may be included, or TV screen may be included.
[0285] The object of data encoding based on the compression regulation of this invention is not limited to the subimage data (color information on three to 4 color) used by specification explanation. You may form into many bits a part for the pixel data division which constitutes subimage data, and may also stuff various information here. For example, if pixel data are made into 8 bit patterns per 1 dot of pixels, the color image of 256 colors can be transmitted only with a subimage (to everything but the main image).
[0286]
[Effect of the Invention] According to this invention, as explained above, after reading the data for one line, whenever it does not carry out decoding but incorporates data for every bit, the configuration of those bit data is fitted to two or more compression regulations, and data are decoded and it goes by the small unit. It becomes unnecessary for this reason, to have a large-scale code table in a decoder like the MH encoding method according to this invention. Moreover, it is not necessary to read data twice and to carry out them like an algebraic-sign-ized method, at the time of encoding. Furthermore, a decoder side does not need a multiplier like an algebraic-sign-ized method on the occasion of decoding that there should just be an easy counter which carries out counting of the bit data. Therefore, according to this invention, decoding also becomes comparatively easy.

[Translation done.]

Drawing selection Representative drawing





[Translation done.]